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THE INDEPENDENT GUIDE TO PERSONAL COMPUTING VOL. 16 NO. 22 DECEMBER 16, 1997

the 14th annual **technical**

excellence

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50 Years of Innovation



Fifty years ago this month—on December 16, 1947, to be exact—Bell Labs introduced a new technology that would change our lives. The transistor found a place in all sorts of equipment in our homes, in our offices, and everywhere in between. From the time you wake up in the morning until the time you go to bed at

night, odds are that you encounter dozens of devices using millions of transistors. Consider the alarm clock, digital watch, radio, television, microwave oven, telephone, car, plane, heating and air-conditioning systems, and so on. All have made the transistor a necessary cog.

And so, of course, has the computer. Today's personal computers involve lots of processors, each with millions of transistors. Intel's Pentium II processor core by itself now has more than 7.5 million transistors.

The transistor was a brilliant invention, and its creators received the Nobel Prize. And it is the innovation spawned from this one invention that we at *PC Magazine* honor each year in our annual Awards for Technical Excellence, starting on page 100.

Many innovative ideas have come to life in 1997, some of which have been very surprising. I can't say that breakthroughs in technology this year have dramatically changed my life, but I can say that these innovations have made a number of noticeable improvements.

Like browsing the Web, for instance. I've used the Internet for years, and the Web became a real part of my job and my life more than three years ago. But this year, I'm lucky enough to live in a community where—as of a few weeks ago—I could get a cable modem. I did—and it's been a wonderful change. Suddenly, the Web is faster at home than in the office (where we share a fast connection among the many machines on our LAN)—and that has made an amazing difference in the amount of time my family and I are spending on the Internet.

And once I get on the Web, there's more interesting material to look at, thanks to the advances in browser technology. Java-based applets and Dynamic HTML have led to some incredibly interesting pages. And

while push technology still has a way to go, there are a number of news tickers and similar items that I keep running on my desktop system.

Another improvement is the relative ease of dictating memos and writing columns. For more than 15 years, I've been writing on a PC. But now I can dictate to my computer using a continuous-speech recognition program, like

Dragon Systems' NaturallySpeaking or IBM's Via-Voice. I don't use these programs all the time, but there are occasions when this is incredibly convenient.

Keeping my schedule is also easier because of recent innovations. *PC Magazine* has long used Lotus Notes for e-mail, group discussions, and a number of business applications. Now I'm keeping my schedule in Notes so that I can replicate it onto multiple machines. I'm able to carry a smaller version. Getting even smaller, I'm also quite impressed by the Rolodex Rex, essentially a way of storing your calendar and contacts on a PC Card with an LCD. It's a read-only device, but that's okay with me—I love its size. The software doesn't yet connect to as many desktop sources, but it fits in my wallet, so I can carry it everywhere.

And let's not forget communications. I'm connecting my computer to more people, more often than in the past. I have a desktop on a LAN at the office, a portable using a wireless LAN at the office, and faster connections than ever before for dialing in from the road, particularly with new 56K modems. I've also been playing with an IP-based phone that lets me get e-mail and even browse certain Web sites from a cellular phone. It's not quite ready yet, but it's a great idea. I'm sure it's the start of a trend.

All these areas are examples of how innovation is changing the computers, software, peripherals, and networks we use. More important, they show how innovation has the potential to change the way we live.


MICHAEL J. MILLER

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The 14th Annual Awards for Technical Excellence

BY MICHAEL J. MILLER

Each fall, a team of intrepid *PC Magazine* editors, senior contributors, and PC Labs personnel comb through the thousands of reviews we've done during the previous year in search of products that demonstrate technical excellence. Every year we wonder whether we will turn up yet another crop of products that raise the bar, set a new standard, or clearly point to the future of computing? And every year we do100



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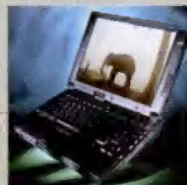
Technical Excellence Live

Want to see what happened when we presented our annual awards at a gala ceremony at the Comdex trade show in Las Vegas? Download the RealPlayer plug-in and join us online to view video highlights of the evening's most dramatic moments. Also on the Web: PC Tech arrives with programming tips, troubleshooting advice, and more.

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Right at Home

BY BILL HOWARD

Make no mistake: Not every PC that a vendor sells for home use was built explicitly for that purpose. Here, we round up PCs designed from the ground up for the home. We test PCs from 11 vendors: 7 mainstream units and 10 high-end systems. We also test 3 sub-\$1,000 PCs127



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SOFTWARE

Improve Your Image

BY SALLY WIENER GROTTA AND DANIEL GROTTA

Photography and the PC. More and more people like the combination. Digital cameras and scanners are cheaper and better than ever. It's now no sweat to manage images on the PC. In this roundup we take the next step: We review image-editing software for the rest of us—packages that are street-priced at \$100 or less and don't require you to have the skills of a professional graphic artist to get some great results178



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HOLIDAY GIFT GUIDE

75 Great Gift Ideas



BY MICHAEL E. RYAN AND KAREN J. BANNAN
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Pipeline

es Mobile

at half the processor's clock speed). Intel hasn't disclosed processor speeds, but they're expected to climb to well above 333 MHz.

In 1999, Intel will introduce the first product built using the IA-64 architecture, code-named Merced. With two architectures and two slot interfaces, the market could get confusing for customers. But the bottom line is really very simple: Slot 2 doesn't replace Slot 1 but complements it. Slot 2 and IA-64 are platform enhancements aimed at very high-end workstation and enterprise-class server designs.

IA-32 and Slot 1 will live on to serve the mainstream desktop and server markets.

These advances promise to make next year's processor market exciting, but whether PC manufacturers choose to support the new architectures remains to be seen. In fact, ample discussion at the recent Microprocessor Forum was devoted to extending the life of the existing architecture known as Socket 7.

Pentium
T
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many



micron P6 micro-processor that will be available in the first half of 1998. Clock speeds will start at 333 MHz; the system bus will run at 66 MHz. Because of a low supply voltage, Deschutes will be the first mobile Pentium II processor.

Late in the first half of the year—presumably with the introduction of a new core-logic chip set—Intel will boost Deschutes's speed beyond 333 MHz and will kick the system bus up to 100 MHz. And around this time, we'll also meet Slot 2: a new interface for high-end workstation and server applications. Slot 2 will enable four-way multiprocessing (Slot 1 designs accommodate just two CPUs) and a full-speed L2 cache (Slot 1-processor L2 caches run



“Microsoft is unlawfully taking advantage of its Windows monopoly to protect and extend that monopoly. We took action today to ensure that consumers will have the ability to choose among competing software products.”

—U.S. Attorney General **Janet Reno**, explaining her request that a federal judge fine Microsoft one million dollars per day as long as it requires PC makers to license Internet Explorer with Windows 95.

Click Your Local Paper

Since Microsoft's Sidewalk and a handful of other Web-based city guides muscled into territory that local newspapers have traditionally owned, print publishers have been realizing that they can do a better job.

Local newspapers around the country are moving full-speed ahead to turn their own arts and entertainment sections into online city guides. The newspapers themselves are providing the reporting and editing expertise, and they're partnering with companies such as Zip2 (www.zip2.com) and CitySearch (www.citysearch.com) for the Web expertise.

.citysearch.com) for the Web expertise.

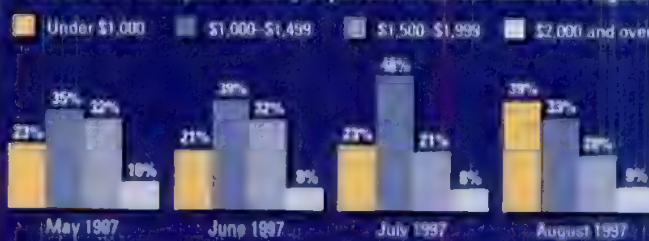
Zip2, based in Mountain View, California, has built a network of over 100 newspapers, and it recently won deals to develop online business directories and guides to local arts, entertainment, dining,



and real estate for the 21 newspapers owned by The New York Times Co. and for some of the newspapers owned by the Hearst Corp.

Heaps of Cheaps

Sub-\$1,000 PCs captured nearly 40 percent of the U.S. market in August.



Retail sales of desktop PCs. Source: Computer Intelligence

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Technical Excellence: You Are There

We handed out our annual awards at a gala ceremony on November 17 and captured the highlights for you to enjoy.

PC Tech Section Debuts

Get advice from experts and go behind the scenes to see how our most popular utilities are written.

Holiday Shopping For Your New PC

Ready to brave the crowds to buy a PC? This section helps first-time buyers cut through the confusion.

First Looks: Now Online

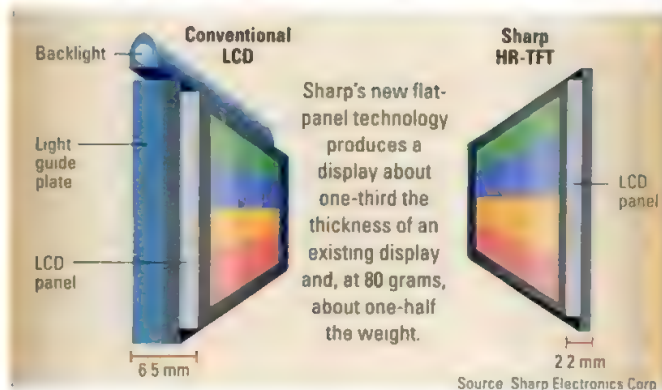
First Looks Online now has reviews of PCs, software, and peripherals on the day the products ship.

And Don't Miss These Web Extras

We have daily reports from the cutting edge of the PC industry as well as weekly commentary from John C. Dvorak, Michael Miller, and Don Willmott.

Pipeline

Sharp Lets the Sun Shine In



Sharp Electronics Corp.'s researchers in Japan have invented a promising reflective display—the HR-TFT Super Mobile LCD—that they say is ideal for use in bright sunlight. Today, reading from a notebook display while you're outdoors is essentially impossible, because sunlight washes everything out. But Sharp goes so far as to claim that the brighter the surroundings, the brighter is the display and the easier it is to see.

By applying a reflective function to the electrodes that drive thin-film transistors used in LCD displays, a professor at Tohoku University came up with a technology dubbed Micro Reflective Structure (MRS). Combining this with Sharp's technique for increasing the percentage of the display surface that passes light, researchers were able to develop a color display that doesn't need a backlight yet has great brightness and reflective efficiency. To top it off, Sharp claims that compared to an equivalent-size backlit LCD, the HR-TFT Super Mobile LCD uses one-seventh the power, is one-third as thick, and weighs half as much.

Sharp expects to begin production in Japan in 1998. The first handheld model will measure just 2.5 inches, to be followed by 4- to 6.5-inch models. So far, the notebook model will be just 8.5 inches, far smaller than existing notebook displays.

Java Applets On Deck

The race is finally on to produce Java-based applications for low-cost hardware platforms such as network computers. Before the end of this year several players, beginning with Lotus, plan to deliver office productivity applets based on Java. The first will be eSuite, a Lotus suite of "write once, run anywhere" applets targeted for shipment in early 1998.



Among the several eSuites is WorkPlace, which includes several lite versions (about 500K each) of standard productivity applications for word processing, creating spreadsheets, composing e-mail, scheduling, charting, Web browsing, and creating presentation graphics.

Other software makers are also racing to deliver Java-based applications. Corel plans to ship its Java-based applications code-named Alta by mid-1998, and Oracle plans to deliver several Java applications during the first quarter of 1998.

THIS ISSUE'S CONTRIBUTORS: Tin Albano, Angela Hickman, Carol Levin, Sebastian Rupley, Carol Venezia, and Don Willmott.

Picket Fences And T1 Lines

Is small-town America ready to be wired? Maine governor Angus King kicked off the first-ever Camden Conference on Telecommunications by announcing that his state "is the first to implement a 100 percent digitally switched phone network and one of the first to wire every school and library." Citing Maine's location as its primary economic disadvantage, King went on to set the theme of the three-day seminar: The Internet is indifferent to geography.

Although an all-star lineup of pundits—including President Clinton's top Internet policy advisor, Ira Magaziner, and MIT Media Lab founder Nicholas Negroponte—pontificated about "the changing nature of



work," only Doug Schuler, founder of the Seattle Community Network, and Risto Linturi, initiator of the Helsinki Arena 2000 project, gave real-world examples of the Internet in action for social change.



Cyrix Chip Line

In the first quarter of 1998, chip maker Cyrix plans to boost the capabilities of its 6x86MX processor architecture by adding support for the Advanced Graphics Port, synchronous DRAM, and a 100-MHz system bus. The company hasn't disclosed details regarding speed, but the chip is expected to operate at the equivalent of 266 MHz.

In the second half of 1998, the company plans to make the transition to the 0.25-micron process, thereby shrinking chip size. Code-named Cayenne, the chip based on this process is expected to include multimedia instructions for boosting 3-D graphics, DVD, and 3-D audio performance.

Around next fall, Cyrix is likely to reveal its plans for a seventh-generation microprocessor, code-named Jalapeño. Company representatives have implied they're considering a circuit-board-inside-a-cartridge design similar to that of Intel's Pentium II.

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Source: PC Data. Data for September 1997

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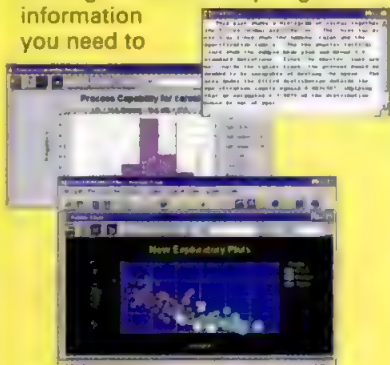
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Letters

DON'T BELIEVE THE HYPE

I am dismayed that an "independent" source of computer information has jumped on the hype bandwagon of manufacturers selling 56K pipe dreams. Buried in a paragraph of your article ("Fast Connections for All?," October 21, 1997) lies the truth: "When an upcoming standard is ratified later this year..." and "these modems can indeed achieve speeds approaching 56 Kbps in the download direction, but only under laboratory conditions. Real-world speeds will average between 40 and 50 Kbps. Finally, to achieve download speeds higher than 33.6 Kbps, your phone line must meet certain technical criteria. If it doesn't, there's very little you can do."

I am very tired of spending time on the telephone trying to explain to laypeople that 56K does not work. As you stated, the standard does not yet exist. The average telephone line barely supports 19.2 Kbps. I am the first person to push useful technology to our associates, but 56K modems are not ready for prime time, and you know it.

JIM DAMICO
Morris Plains, New Jersey

I enjoyed reading your story on 56K modems. It is interesting to note that you mentioned only seven online services that are providing "trial" 56K terminals. Most small ISPs have been providing 56K access for a while now; many alternatives to America Online are providing 56K access. While I agree that modem speeds of up to 53 Kbps are possible under top conditions, most of us will achieve only 33.6 Kbps or even only 28.8 Kbps. Until phone companies can provide us with "true" digital lines, I see most of us cruising along at 33.6 Kbps or less.

JORG BIELAK
via the Internet

The only time I get close to 28.8 Kbps is when I'm downloading large upgrade files (usually early mornings and weekends). I may be wrong, but isn't having a 56K modem like driving a high-power car on the freeway when traffic conditions allow only 15 mph? I'm leery of investing in a Ferrari and receiving Yugo results.

DEAN ANKENY
via the Internet

Since I own a 3Com product, it was nice to see the 3Com Sportster 56K Faxmodem selected as an Editor's Choice in your 56K-modem roundup, but I am not happy with the company. After I spent \$199 for a 33.6-Kbps modem, 3Com said that for another \$60, it would upgrade the modem to 56K. There's no way I'll



"56K modems are not ready for prime time, and you know it."

agree to that. I would have been smarter and better off to wait and buy a 56K modem.

BRIAN L. HAYES
Clackamas, Oregon

THE NEW NET

In regards to the article "Internet: Part 2" (Trends, October 21, 1997): While usage-based models for Internet access may well be inevitable, especially in light of recent changes in how UUNet charges service providers for access, such a change would have implications for all content providers on the Web. First, are ISPs going to continue to offer space to advertisers? Second, how does this affect content providers who allow free access to anyone with an Internet connection? If there is a return to fees driven by usage, certain sites could be hurt or forced to charge access fees of their own. If you change the model for access, you change how people will access. If they have to watch the clock, there will be fewer hits and less time spent at these sites.

MICHAEL SOLOMON
via the Internet

LOST IN EUROPE

Thank you for your excellent review of trip-planning software in the October 21 issue (First Looks, "Travel Aid from Your PC"). I have been using Microsoft Automap (now Microsoft Expedia Trip Planner 98) since its DOS version, and have found it very useful. However, the program's present usefulness seems confined to the United States. In the past, Automap offered a set of European maps, which were of some help but lacked the detail and the inclusion of smaller towns as

found in the U.S. set. But Microsoft never upgraded these, and apparently there are no plans to do so. I have been unable to find CD-ROMs of detailed, current European road maps for use with any of these programs. Surely there are enough Americans who plan business or pleasure trips on their own to make such an offering feasible, not to mention the European market. In addition, the demand for maps of areas other than Europe and the U.S. should be evaluated.

THOMAS V. DiSILVIO
via the Internet

TURN HERE

I disagree with your implication that a GPS must be hooked up to a laptop in your car in order to run (First Looks, "PC Backseat Driving," October 7, 1997), but I agree that such a requirement would be a poor idea. I can upload data from AAA Map'n'Go from my desktop PC to my Garmin GPS II. Once I have the data loaded, it appears on my dashboard and indicates where I should turn. I tried this method on a trip from Ohio to Mississippi and was amazed at how accurate the information was. I think that this is a most useful feature of GPSs that you overlooked completely. It isn't explained completely in the documentation, and I had the software and the GPS for a while before I realized that they could work together.

JERRY BANGHAM
Port Gibson, Mississippi

NO NOVELL?

Your October 21 Net Tools roundup of network management tools ("TKO Your TCO Today") was interesting, but I was surprised to find no mention of Novell ManageWise or Novell Application Launcher (NAL). You made a special exception to review Microsoft Systems Management Server, even though it didn't "pass the filter," but you ignored the Novell products. Several of my clients use NAL every day, and it is an effective and useful software distribution product. I can't say I'm surprised by your editorial choice, however. It is just a continuance of what I perceive as a long-standing bias for Microsoft and against Novell. NetWare is still outshipping Windows NT and, of course, has a much larger installed base. Yet *PC Magazine* rarely even mentions it. Perhaps you can prove me wrong and use your new Net Tools section to provide more Novell coverage.

TODD DAILEY
via the Internet

COLOR COMMENTARY

I was impressed with your latest review of color laser printers ("Color for the Pros") in



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Letters

the October 21 issue. I was glad to see that you explained the fine art of gray-scale simulation—namely, dithering. However, you failed to mention one of the best methods of simulating gray-scale: Minolta's LIMOS (Laser Intensity Modulation System). This process is used in Minolta's CF900 color copier/printer and offers about 10 percent less quality than dye sublimation at a fraction of the cost per printed page. Compare tabloid-size prints at less than \$1 on the CF900 versus \$10 on a Tektronix Phaser. Granted, this equipment falls outside of the realm of your evaluation, but I think this is where laser printers will head some day and is worthy of note.

TOM FRANCIOSI
via the Internet

Regarding your review of color printers: An important consideration for me is a printer's ability to handle paper and sizes of varying weights. The HP 5M is a major disappointment in that it continually jams on anything heavier than 24-pound paper, feeds Avery Laser Labels only occasionally, and is extremely reluctant to accommodate manual duplexing. Our particular machine has often been down, and I rue the day that I recommended it based on my better experience with the HP 4M (which, strangely enough, was much more tolerant of oddball papers). Adding a paper-centric torture test to your printer reviews would help demonstrate how printers survive the real world.

ROSS FLAVEN
via the Internet

I simply don't understand how any reputable magazine can recommend ink jet printers for

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CORRECTIONS AND AMPLIFICATIONS

In our November 4, 1997, Table of Contents, we mistakenly listed the Second Looks products for the November 18, 1997, issue.

printing photographs without bold warnings that the picture will fade into near obscurity within a year. Where's the sidebar on longevity?

WAYNE D. JOHNSON
via the Internet

SAVE BUT DON'T PRINT

Most editorials on the subject, including Michael J. Miller's ("The PC's Changing Image," October 7, 1997), imply that printing out digital photographs is the killer application. Why print? By keeping my photos on-disk, I avoid the waste of time and shelf space caused by creating physical photo albums. Better yet, by tagging the photos with keywords, I can create albums on the fly that suit my mood. And keeping backups on a remote server ensures that my memories will survive even the worst fire.

GEORGE F. RICE
Arlington, Texas

COMPLEXITY BREEDS FLAWS

In John C. Dvorak's column "Clunker-Caliber CPUs" (October 7, 1997), he states his opinion that it is sad that software shipped these days contains so many flaws. That assumption—if we produced relatively bug-free software five or more years ago, it should happen in the present as well—is flawed. The industry has seen huge growth in the development of object-oriented programming because what consumers want is inherently complex. The complexity and size of today's software are directly associated with the number of bugs that slip through. We are not dealing with code that fits into 640K of memory: It's more like several megabytes.

DAVID SWIGGER
via the Internet

MICROSOFT'S WIN-WIN DEAL

I'm writing in response to Jim Seymour's column "Microsoft/Apple: A Win-Win Deal" (October 7, 1997). Seymour writes that Apple has admitted that it lost the PC war to Microsoft and now, with \$150 million from Microsoft's purchase of common stock (and no seat on the board of Apple's directors), has won a cross-licensing agreement. But Apple has to preinstall Microsoft Internet Explorer on all new Apple computers. Seymour fails to cover the real losses of Apple and Netscape adequately. By buying into Apple, Microsoft is essentially preventing Apple from filing lawsuits regarding the copying of Mac OS to Windows. Microsoft also has protected itself from lawsuits by having a cross-platform deal over the next couple of years. Soon, Netscape will lose its hold on the PC and Mac market

because of three factors: Microsoft is combining Internet Explorer with Windows, Microsoft is tightly integrating its software into the Web by using Internet Explorer, and finally, with its new alliance with Apple, Microsoft now has Internet Explorer pre-installed on both Macs and PCs.

PATRICK TROEN
Victoria, British Columbia, Canada

HTML STILL STRONG

Jim Seymour expressed two opinions in the close of his September 23 column (Building Web Sites: A Top-Down Job") that I question. In the last paragraph he says, "HTML is a feeble, infuriating language...." HTML isn't feeble, weak, fragile, or decrepit. Rather, it is—precisely as intended—a flexible framework of tags for identifying elements of a hypertext document. HTML succeeds admirably in both tagging and flexibility.

Seymour also calls HTML "infuriating." Here I most strongly disagree. It's a huge mistake to be fooled into thinking that HTML is frustrating your attempts to build a good site, when the fault really lies with the arrogance of project managers, code designers, and programmers at Netscape and Microsoft (and a very few other browser builders), who arbitrarily and whimsically decide how to interpret the flexibility of HTML. They take advantage of HTML's flexibility so that we, the end users, cannot. Instead, we are left with the truly infuriating task of resolving differences between these giant children who can't learn to play together. Competition is good; abuse of power is not.

MIKE PEPPER
via the Internet

MULTIFUNCTION OR FICTION?

From the tone and content of your Second Looks article on the Hewlett-Packard OfficeJet Pro 1150C multifunction machine ("The Machine That Could," October 7, 1997), it appears that you made the assumption I did when I bought one earlier this year: that any machine marketed by HP as a SOHO product would be compatible with any of the three Windows operating systems in widespread use today. Imagine how dumbfounded I was to discover that when the OfficeJet's scanner is connected to my desktop computer, which runs Windows NT Workstation, it is nonfunctional, and the printer works acceptably only when configured as a HP DeskJet 660C. To make matters worse, HP told me that it has no intention of rectifying this outrage.

VERNE THOMPSON
Raleigh, North Carolina



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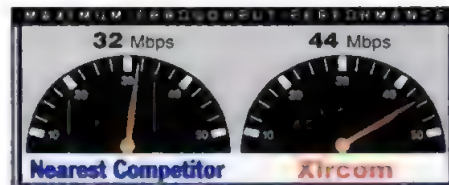
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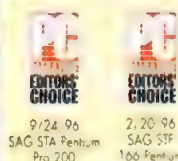


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Trends

What's a Qubit, and Do You Want One?

Quantum computers promise unprecedented speed increases.

Fifty years ago, the inventors of the digital computer couldn't have imagined the computing power and the small size of the digital devices we live with today. If the physicists, mathematicians, and computer scientists working on quantum computing today are successful, we may be in for an equally impressive technological transformation over the next few decades.

Still in the early stages of development, quantum computers hold the promise of a fundamental breakthrough in computing power. They enter the realm of what mathematicians describe as "hard problems," going beyond what any existing computers can solve in a practical time frame. Quantum computers work from an entirely different model of computation derived from the quantum-mechanical nature of physical reality.

Scientists describe quantum computers in the language of quantum mechanics. The smallest unit of information is a quantum bit, or qubit. Qubits don't behave in an on/off, binary way. Instead, they exist in multiple states simultaneously, so they can process multiple computations in parallel.

WAVE BEHAVIOR

The advantages of quantum computers go beyond parallelism: They exploit the quantum-mechanical Principle of Superposition. Qubits interact like waves, with in-phase qubits reinforcing and out-of-phase qubits canceling. Quantum algorithms—programs that compute with qubits and run on a quantum computer—take advantage of this wavelike behavior, representing a problem in a way that lets the correct answer be reinforced and lets all the wrong answers be can-



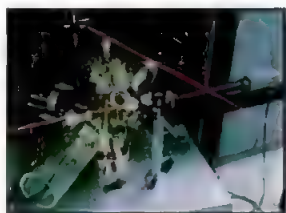
Hard Problems Made Easy

Imagine trying to find a name in an unalphabetized phone book. As the number of records increases by a factor of 100, the number of records a classical algorithm would need to search also increases by a factor of 100. The number of records that a quantum algorithm needs to search increases only by a factor of 10. The trick is in the clever way a name is represented in a quantum algorithm to let a single search check several names

Records in an unsorted database	Records a classical algorithm must search*	Records a quantum algorithm must search*	Speed up factor
1,000,000	500,000	1,000	500x
100,000,000	50,000,000	10,000	5,000x
10,000,000,000	5,000,000,000	100,000	50,000x
1,000,000,000,000	500,000,000,000	1,000,000	500,000x

* For a 50 percent chance of finding a specified record

celed out. For these reasons, qubits can represent vastly more information than classical bits. Computational speed can be exponentially faster for some problems.



ION TRAP: At the Los Alamos laboratory, work continues on a prototype quantum computer.

Two conditions must be met before quantum computers will work: Algorithms that can take advantage of quantum "weirdness" must be designed, and physical computers that can execute those algorithms must be built. The first condition was actually met three years ago, when Peter Shor of AT&T Labs produced a quantum algorithm for

factoring integers that is believed to work exponentially faster than any classical algorithm. Shor's result has created quite a stir in the world of cryptography, because such an algorithm could be used to crack RSA-type public-key cryptography, which involves a type of code currently regarded as highly secure.

Last year, Lov Grover of Bell Labs announced another breakthrough. He had discovered a quantum algorithm for searching through unsorted data in a database. This is important, because many problems can be formulated as searches. If you're searching for a single name in a list of 100 million unsorted names, a classical algorithm would have to examine 50 million names to have a 50 percent chance of success. Grover's algorithm would need only about 10,000 database accesses to have the same chance of success. This is possible, Grover explains, because "quantum-mechanically... [one can] explore multiple records simultaneously." The 5,000-fold speed-up would increase for bigger databases.

ENERGY LEVELS

As for actually building a quantum computer, the race is on. Research projects are underway all over the world. At Los Alamos National Laboratory, a team headed by Richard Hughes is exploring the use of an ion trap computer. Calcium ions lined up in a vacuum are held in place by an electric field, and lasers act on the outermost electron of each of these ions. An individual qubit is represented by

the energy level of a single ion's outermost electron. Currently experiments are underway to determine this technology's potential and limitations for simple quantum computations with a small number of qubits.

Meanwhile, other labs are exploring a variety of other technologies. Two that are considered especially promising are nuclear magnetic resonance (NMR) and quantum-dot. Although these projects show promise, the age of quantum computing is still years away; implementing Shor's algorithm, for example, would require something like a billion times as much computing power as is now available.—Marc M. Groz

Multiplying Machines

DSPs promise cellular video phones.

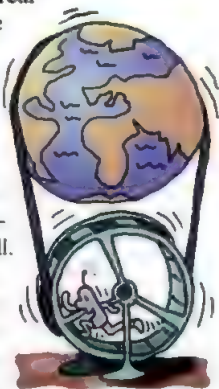
The digital signal processor lives in the shadow of its rich and famous cousin, the microprocessor, but a DSP is reporting to work in every fax machine, modem, digital cellular phone, high-performance hard disk, and digital television. It's estimated that by 2010, DSPs will be ten times as powerful at multiplying as the most powerful microprocessor. According to the market research firm Dataquest, the DSP market is growing by 30 percent a year, nearly double the growth of the semiconductor market.

DSPs are specialized number-crunching semiconductors that analyze data in real time. They collect, process, compress, transmit, and display sounds and images. A DSP isn't all that complicated. In fact, it doesn't do much more than multiply, but it does so blindingly swiftly—up to a billion operations a second, says John Scarisbrick, senior vice president of the semiconductor group at Texas Instruments.

DSP research started out in the 1960s at Bell Labs and MIT, where researchers were curious about applying math to real-world signals. In the 1970s, the U.S. military used the technology for securing communications over radar. The first commercial product using a DSP was Texas Instruments' Speak & Spell.

At a recent conference of top companies in the field, researchers speculated on future applications, including 3-D digital photography and real-time video compression for cellular video phones and Web videoconferencing. According to Scarisbrick, video applications "will be eminently realizable in two to three years at the current rate of DSP advances." Other gadgets on the horizon are "world phones" that support multiple cellular standards, ultra-high-speed modems, high-capacity digital cameras, collision-avoidance radar in cars, and mobile ultrasound systems to transmit images via satellite.

Bell Labs, Hitachi, HNC Software, Motorola, Nortel, Philips Electronics, Siemens, and Texas Instruments are just a few of the companies inventing DSP applications. Texas Instruments recently established the \$25 million DSP University Research Fund, which is devoted to developing the next wave of algorithms for products of the next millennium.—Carol Levin



INSIDE PC LABS

Fuel-Efficient Web Searching

IN OUR SECOND ANNUAL LOOK AT WEB search sites ("Your Complete Guide to Searching the Net," December 2, 1997), we reviewed 12 search indexes and directories, gauging their effectiveness for simple and advanced searching. During the course of testing, we found that by running a single, well-chosen query against each search site, we learned a lot about how they work. Getting a feel for engines in this way will help you use them more effectively and help you decide which search engine is appropriate for a particular task.

To illustrate this point, we ran the simple query *economy cars* (without quotation marks) against each search site and compared the results. Our intention was to get information about which makes and models of cars are most fuel-efficient, but the search engines didn't read our minds. Instead, they found Web pages where the words *economy* and *cars* appeared most frequently or most prominently. Those pages turned out to belong to rental-car places and online car dealers, many of them in other countries. Yahoo! was the most off-base, returning hits for all titles including the keyword *cars* in its "Business and Economy" category.

Many search engines will attempt to anticipate what you're looking for by placing an appropriate advertisement on the return page. Although this technique can often lead to exactly what you're after, it's hardly foolproof. For example, HotBot showed us an ad for the Lexus LS 400, hardly an economy car.

Some search sites—including Excite, InfoSeek, and Lycos—suggested keywords to include in our query, but we found this attempt to second-guess our intentions distracting.

Not every site came up empty regarding our original query. Some engines did more concept searching in addition to searching

strictly by keyword frequency, which led us a bit closer to what we wanted. InfoSeek found "Seth's Small Car Comparison Summary" (www.lm.com/~seth/cars/cars.html). AltaVista found an Environmental Protection Agency page that contained a thread about how mileage ratings are calculated.

CONCERNED SCIENTISTS' REPORT

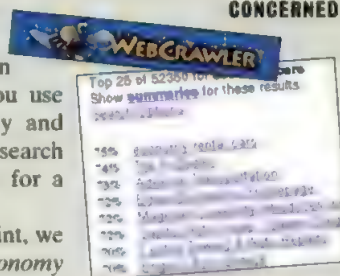
The lesson we learned is that to find information on fuel-efficient cars, running the query *fuel efficient cars* (again, we did not use quotation marks) produces excellent results. Our number-one hit on AltaVista, for example, was the Union of Concerned Scientists' 1997 report on the most fuel-efficient cars (www.ucsusa.org/transportation/autocars.html). Our number-two hit was a news item about the Environmental Protection Agency's rankings for fuel-efficient cars (www.theautochannel.com:8080/news/date/19961001/news02071.html). By simply thinking for a moment about what we really wanted, we turned a frustrating search experience into a fruitful one.

But our fourth hit was a page about fuel-efficient cookers (www.ce.ufl.edu/activities/cooker/fecons.html). From this

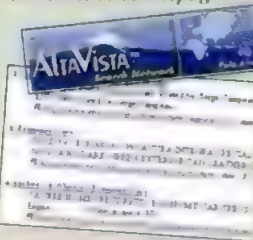
result, we inferred that AltaVista weighed *fuel* and *efficient* more heavily than the more common word *cars*, thereby ensuring better hits at the top of our list.

The key is to think like the search engine. Avoid words that occur too frequently. Most engines accept quotes for exact phrases (or let you specify an exact search via the interface), and that's also an effective and simple means of filtering out unwanted junk.

Check out PC Magazine's Virtual Labs site (www.virtual-labs.com), where you can run queries against multiple engines simultaneously and compare returns.—Larry Seltzer and David Lidsky



LOOKING FOR AN ECONOMY CAR? A search on WebCrawler found The P-Bodies and Eddie Boroevich's Homepage.



UNUSUAL FIND: AltaVista produced "Prices and specifications for economy cars from \$18 a day" as its top choice.

Warning: This PC May Be Offensive

Will V-chips turn up in computers?

The V-chip may be headed for your computer, now that the Federal Communications Commission is exploring the possibility of making PC manufacturers include one with every PC. V-chips, which will show up in new televisions, enable parents to block programming they deem offensive, based on a common rating system.

Since a PC equipped with a broadcast receiver can tune into offensive content just as easily as can a TV, the FCC figures that parents should have the same ability to block programming on their PCs as they will have on their TVs. Under the Telecommunications Act, the FCC must adopt rules that require most television receivers to be equipped with features enabling viewers to block the display of video programming with a common rating. According to the

ruling, the V-chip is "intended to give parents the ability to block video programming that they don't want their children to watch." The FCC is also obliged to "oversee the adoption of standards by industry for blocking technology, and to ensure that blocking capability continues to be available to consumers as technology advances."

The possibility of the government forcing manufacturers to build V-chips into PCs threatens to fuel an already contentious debate over online censorship. Critics of the idea are worried that, in the absence of a universal rating system for Internet content, the government may attempt to use V-chips to impose its own rating system. In the past, President Clinton has stated that he would push the industry to develop a V-chip for personal computers.

"Conceptually, that's not such a big step. But practically, it's hard," says Marcelo

Halpern, an attorney with Gordon & Glickson P.C., a law firm specializing in information technology. "The FCC has certain jurisdictional boundaries in this issue. The FCC doesn't have the authority to regulate the global Internet," he adds.

The possibility of such regulation doesn't sit well with the personal computer industry, which is working toward self-regulation of Internet content. Currently, the vast majority of Internet service providers offer customers software that they can use to prevent objectionable material from reaching their kids' desktops.

Further, the personal computer industry is encouraging the use of third-party rating systems such as RSAC (Recreational Software Advisory Council) and PICS (Platform for Internet Content Selection.)

—Angela Hickman



JAKE KIRCHNER

Rule #1: Never Argue with the Ump

When talk turns to antitrust, you hear a lot about the need for "a level playing field." The idea is that it's legal to dominate your competitors so long as everyone is playing in the same park and everyone abides by the same rules. Would that it were so simple—in business or in sports.

Of course, even in sports, playing fields are rarely level, and we all know about the home-field advantage. The keepers of baseball diamonds know how to groom the infield dirt and grass to compensate for a slow cadre of infielders or to help a speedy lead-off batter. Football-stadium groundskeepers advise their teams' quarterbacks on swirling wind patterns in the end zones.

Savvy teams know just how far they can go to exploit the home-field advantage. And you would think every team knows not to spit on the umpire. Getting back to antitrust, these are lessons one has to conclude Microsoft evidently hasn't mastered. After the company bested the Justice Department in negotiating the 1995 consent decree between the two parties, Microsoft acted as if the DOJ Antitrust Division was just another vanquished opponent. In reality, the justice lawyers are not the competition—they're part of the officiating crew.

Regardless of the outcome of the DOJ's recent complaint that Microsoft's practices in licensing Windows and Internet Explorer to PC vendors violate the consent decree, Microsoft has clearly made a serious strategic error. Rather than relying on consent-decree interpretation from its internal corporate counsel, the company should have done everything possible to make sure the Justice Department approved of the company's licensing practices. To all



appearances, Microsoft officials have strutted across the field as if the "rules" don't apply to them or as if the referees never showed up.

The Atlanta Braves' studious pitcher Greg Maddux is as competitive as any professional athlete of our time, but he takes the mound with a gentlemanly air; he gets many breaks from umpires even if he occasionally brushes back opposing batters. The Chicago Bulls' Dennis Rodman bares his in-your-face flamboyance on the court, and his opponents routinely slam him to the floor as the refs look the other way. Bill Gates and his minions lack the braggadocio—not to mention the tattoos and painted hair—of Rodman, but they have a lot to learn about how to play the antitrust game.

On more than one occasion, Gates has shrugged off concerns about the Justice Department and the courts. If we're told to change our ways, he says, we'll live with whatever remedy is imposed on us and keep going. But it won't be that simple if the outcome of the current contest is to make it impossible for Microsoft to integrate Internet Explorer into Windows 98. At the very least, the early reports on the DOJ complaint suggest the company tried to push the 1995 consent decree to its very limit by playing fast and loose with the concept of "integrated" products.

If this new legal challenge goes badly for Microsoft, Gates and his team will have only themselves to blame, whether the Justice Department acts "fairly" or not. If you're a player who plays so close to the sideline that your uniform is perpetually coated with chalk dust, don't bother feigning surprise when you're whistled out of bounds.

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HOME PCS

For the Homefront

Though this issue's home PC feature, "Right at Home," examines 21 machines spanning three separate subgenres and 13 manufacturers, several noteworthy systems from major market players Acer, AST, NEC, and Sony were not available in time to be included in our story.

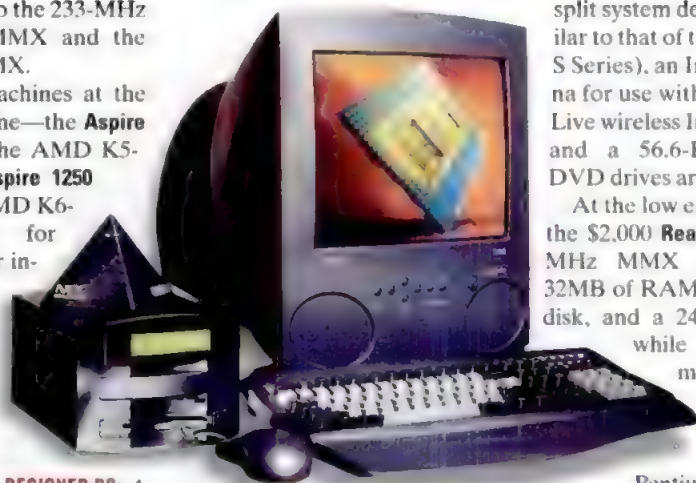
Acer America Corp. (800-733-2237, www.acer.com), the sixth-leading seller of home PCs, recently refreshed its Aspire line, quintessential home machines known for their attractive appearance and excellent out-of-box experience. These mini-tower and desktop models, now available only in charcoal or bridal white (Acer's emerald case has been discontinued), offer processors ranging from the AMD K5-166 and the 200-MHz Pentium classic to the 233-MHz Pentium with MMX and the AMD K6-233MMX.

Two AMD machines at the low end of the line—the **Aspire 1240** (based on the AMD K5-166) and the **Aspire 1250** (based on the AMD K6-166MMX)—sell for \$999. The former includes a 14-inch monitor; the latter does not. Each system is outfitted with 16MB of EDO DRAM, 256K of secondary cache, a 2GB hard disk, a 64-bit graphics accelerator (with 1MB of EDO video memory), a 12X maximum CD-ROM drive, and a 33.6-Kbps modem.

The high end of the line, the \$1,699 **Aspire 2181**, includes a 233-MHz MMX Pentium, 32MB of EDO DRAM, 512K of secondary cache, a 6.4GB hard disk, a graphics accelerator with 2MB of EDO video memory, a 24X maximum CD-ROM drive,

and a 56.6-Kbps modem. A 17-inch monitor costs \$499. Each model ships with Acer's one-year warranty and a software bundle complete with Microsoft Encarta, Microsoft Works, Microsoft Money, Intuit Quicken SE, and McAfee VirusScan.

Every Aspire machine comes with color-coded cables, a setup poster, and a simple Windows 95 front end—the Acer Computer Explorer, which provides easy access to frequently used applications. The Acer Service Center, a second software utility, provides maintenance, diagnostic, and support information, while the Acer Aspire Owners' Area, a subsection of the company's Web site, provides driver updates and support information specific to each Aspire model. The latter is



DESIGNER PC: A unique look from NEC's DuoFlex Chassis.

accessible at no cost through the duration of the system's warranty. Acer provides three hours of free Internet access for the first twelve months.

AST Computer (800-876-4278, www.ast.com) is slowly moving its business away from the home market. The company is continuing to sell its existing home machines, but it intends to focus on business systems and move into the burgeoning handheld market.

The company's Adventure! PC—which was one of the first machines with a monitor under \$1,000—is still available at Wal-Mart retail outlets.

These modest systems are each available with a low-end classic Pentium or AMD K5 processor, an 8X CD-ROM, a 33.6-Kbps modem, a 14-inch monitor, stereo speakers, and ample software bundles.

The recently refurbished Ready series from NEC (888-306-4636, www.nec-computers.com), covered at length in TrendsPCs in our issue of October 7, 1997 ("Home Is Where the PC Is"), is a high-end alternative to the value machines sold by sister company Packard Bell. Machines in the new Ready series are available with NEC's DuoFlex chassis (a split system design that's similar to that of the IBM Aptiva S Series), an Internet Antenna for use with the Airmedia Live wireless Internet service, and a 56.6-Kbps modem. DVD drives are optional.

At the low end of the line is the \$2,000 **Ready 9753** (a 233-MHz MMX Pentium with 32MB of RAM, a 4.3GB hard disk, and a 24X CD-ROM), while the top-end model features the \$2,500 **Ready 9763** (a 233-MHz

Pentium II with 32MB of memory, a 7GB hard disk, and a 24X CD-ROM). NEC's software bundle includes Microsoft Word 97, Microsoft Money, Microsoft Encarta, Microsoft Publisher, Microsoft Bookshelf, McAfee VirusScan, McAfee WebScan, and more; its warranty grants a year of parts, labor, and on-site service. Prices above do not include monitors: Add \$349 for a 15-inch monitor and \$599 for a 17-inch monitor.

Sony Electronics (800-476-6972, www.sony.com), entering



INPUTS: One of Sony's latest VAIO systems.

only its second year in the home PC market, recently announced three new VAIO (Video Audio Integrated Operation) mini-towers: the \$2,400 **Sony PCV-200** (a 233-MHz Pentium II model with a 4.3GB hard disk), the \$2,700 **Sony PCV-220** (a 266-MHz Pentium II with a 6.4GB hard disk, which is reviewed in this issue's First Looks section), and the \$3,300 **Sony PCV-240** (a 300-MHz Pentium II). These "Creativity PCs" each typically include a 100MB Iomega Zip drive, a 24X CD-ROM drive, AGP graphics (4MB of SGRAM), a 33.6-Kbps telephony modem, video in and out ports, and a TV-Tuner. Every external component, from mouse to mini-tower, is housed in a contoured violet and gray case.

The aforementioned prices do not include monitors. Sony's multimedia monitor, which integrates speakers and a sub-woofer, ranges from \$500 for a 15-inch model to \$830 for a high-end 17-inch model. The company also offers such optional peripherals as a \$600 All-in-One printer—which affords printing, faxing, copying, and scanning capabilities—and a \$600 digital camera. Each machine ships with a servicable software bundle (Bookshelf, Money, Works, Quicken, Starfish Sidekick, as well as several video and audio titles) and a one-year warranty (six months of on-site service is included). —Cade Metz

PIMS

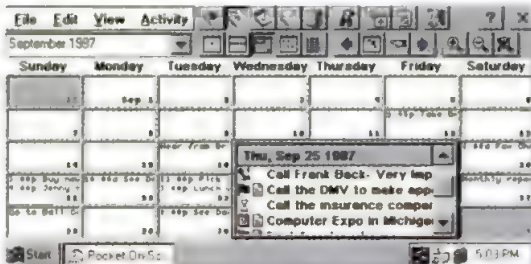
Always Stay in Touch

With a broad appeal across the spectrum of networked corporate users and individuals trying to keep track of their contacts, personal information managers (PIMs) have become vital to most computer users. As reflected by the latest wave of PIMs to hit the market, vendors are waging a constant battle to keep them loaded with sophisticated features that are efficient, compatible, and easy to use.

Day-Timer Concepts (800-225-5005, www.daytimer.com) has upgraded its product Day-Timer. Priced at \$60 (street) for the standalone version and \$480 for a ten-user license, **Day-Timer Organizer 98** has a number of new enhancements. One of the most noteworthy is the addition of ExpressServices, an umbrella for three tools—ExpressPhone, ExpressAct, and ExpressInput—that lets you quickly access the most-used functions of Day-Timer without having to open the program itself. The icons are located within the Windows 95 taskbar, so you don't need to click back and forth between applications.

With ExpressPhone, you can speed-dial your frequently called numbers with a single click. ExpressAct gives you instant access to your to-do list, which in turn is linked back to relevant references in Day-Timer. The ExpressInput function lets you make entries directly into the Schedule, Task, or Notes section of Day-Timer.

Also new to Day-Timer is OLE automation, which lets you read, view, or print data from other PIMs. This makes it easier than ever to transfer databases of software products like Microsoft Schedule+, Microsoft Outlook, and Symantec Act di-



TAKE IT WITH YOU: Odyssey's Pocket On-Schedule provides you with a full-featured PIM.

rectly into Day-Timer. Other new features include a rich text editor, improved expense-report functions, and the ability to print in color.

Are you a die-hard PalmPilot user? Then try **Sidekick 98**, from Starfish Software (888-782-7347, www.starfish.com). The biggest news with this version—which sells for \$50 (street)—is the introduction of Starfish's TrueSync synchronization software, which lets you synchronize data between your desktop and popular information devices. TrueSync supports Windows CE 2.0 devices, 3Com's PalmPilot, and also the credit card-size Rolo-dex REX from Franklin Electronics.

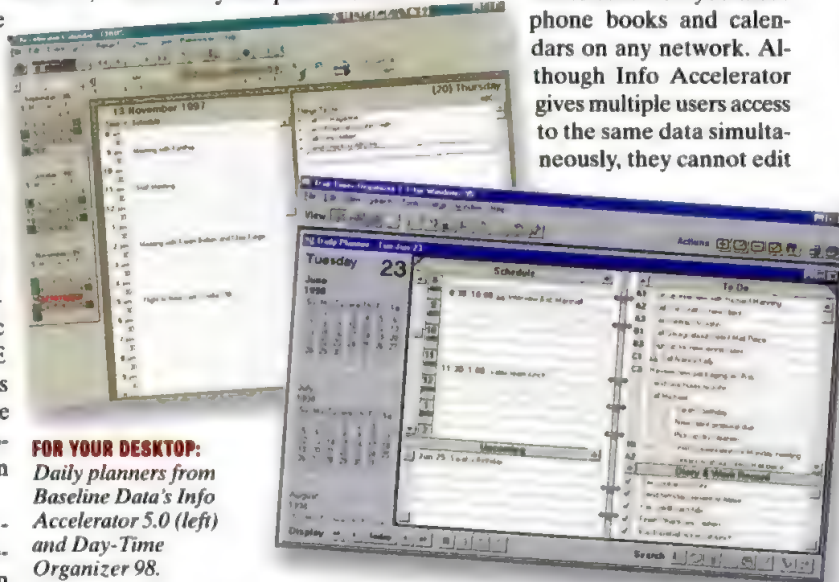
There is also improved Internet support and integration with POP3 e-mail clients as well as the ability to generate HTML pages from your Sidekick contact and calendar databases (thus making it easy to share that information with other people

across the Web or intranet).

Pocket On-Schedule 2.0, which comes from Odyssey Computing (800-965-7224, www.odysseyinc.com), brings even more functionality to the Windows CE platform. A full-featured contact manager costing \$90 (street price), Pocket On-Schedule offers several innovative features, including the ability to have new Phone Book, Calendar, To-Do list, and Journal views.

The Phone Book view provides a profile of your contact history. From within this view, you can create ad-hoc links, log your calls, and coordinate sending e-mail and faxes. With the Calendar view, you can easily look at your daily activities or view your

activities up to six months out; the automatic calendar notification feature will help keep you on schedule. The To-Do List now lets you compose, schedule, edit, and prioritize items, all while linking back to the contacts in your phone book.



FOR YOUR DESKTOP: Daily planners from Baseline Data's Info Accelerator 5.0 (left) and Day-Timer Organizer 98.

Meanwhile, the Journal view provides a listing of your activities, appointments, and links.

As an added bonus, Pocket On-Schedule lets you have the flexibility to check your appoint-

ments and plane or hotel reservations while you're traveling.

Offering a personal information manager with a twist is Baseline Data Systems' **Info Accelerator 5.0** (800-429-5325, www.baselineconnect.com). This \$100 (street) package is essentially designed to run within a number of Windows applications, including Microsoft Word, WordPerfect, and Ami Pro.

Info Accelerator 5.0 comes with a phone book, calendar, and to-do list. It also has the ability to generate document templates, faxes, labels, and mail merge from within your word processor. The Universal Address Book includes the Computer Software Translator button bar, which uses Baseline's new SmartLink Technology to allow Info Accelerator's phone book to work with most Windows applications and fax software. SmartLink Technology also allows you to transfer information between applications by clicking on the CST button.

Available in a network version as well (\$119.95 for a server license, \$99.95 per user), Info Accelerator lets you share phone books and calendars on any network. Although Info Accelerator gives multiple users access to the same data simultaneously, they cannot edit

the same data at the same time. The MiniBook feature allows you to print double-sided address books or calendars to take with you wherever you may go.—Christina M. Evelyn

RECAP PC Magazine reviewed 17 contact and information managers in our August 1997 issue. Day-Timer Organizer 2.1, ECCO Pro 4.01, and GoldMine 3.2 for Windows 95 and NT 4.0 were given Editors' Choice awards.

Right On Schedule!



GATEWAY 2000

EXPRESS



welve years ago, in a place far from the Silicon Valley, Gateway 2000 was born with a dream of giving the people a rare combination of price, quality, service and technology for the finest value in the computer kingdom. Today Gateway is a tradition. Year after year, people continue to turn to us for the best overall computer value. That's why we weren't surprised when an IDC/ACNielsen survey of computer owners showed Gateway had the highest brand loyalty of *any* computer maker in the U.S. home market.* You're invited to join our family too, or return for a reunion, this magical season.

Gateway More



The Gateway Holiday Express is here, and it's loaded with all the latest technology — quality tested and ready to be your digital locomotive! Whether you're looking for increased productivity or a complete workstation solution, Gateway has it. All the cool features are on board, and we're making them more affordable than ever before.

Get on track for the best computer packages ever. Call Gateway today!

*Based on percentage of computer owners planning to buy another computer of the same brand as they currently own between 11/1/96 and 7/31/97



Delivers Holiday Magic.



"You've got a friend in the business."®

800-270-5733

www.gateway.com



Get Your Ticket Today!



All aboard! Gateway is your ticket to the ideal computer system. We know the computer industry *and* we understand your needs. So we made shopping for a system easy by giving you several computer categories to choose from.

If visions of powerful performance and mobility dance through your head, hop on the **GATEWAY™ Solo™** portable PC train. Keep group computing on track with our **Destination® Digital Media Computer** and its huge 31-inch or 36-inch (35.5-inch viewable) screen. Or find business solutions with our **GP-Series** systems and **NS-Series** servers. Gateway 2000 Major Accounts, Inc. has reliable **E-Series** desktops, workstations and servers for corporate customers. And your family will discover their wishes have all come true with a value-packed **G-Series** multimedia PC under the tree. Gateway lets you do your home and business computer shopping at one place — at prices that won't break your budget. Plus we have several affordable financing options.

It truly is the perfect time to buy the system you've been dreaming about all year! Call us today and live happily ever after.



 **GATEWAY2000**

"You're up next in the business."

800-270-5733

www.gateway.com

**We'll Heat Up
Your Holidays**

They may be predicting record lows on the prairie this winter, but Gateway 2000 is stoking the fire with hot new technology and even better service for our customers. Close, long-term relationships with suppliers like Western Digital, U.S. Robotics and Intel help us see where the industry is headed. That's why we deliver the power of Intel's next-generation **Pentium® II** processor to both the home *and* office. We've also teamed up with software developer, Microsoft, and entertainment trend-setter, DreamWorks Interactive, to give you a choice of top-selling software. Call to find out about all this hot stuff.



GATEWAY™ NS-Series Servers

Take your business network off the back burner and get connected with Gateway's affordable NS-Series server line. Together with ALR, an established leader in the server industry, Gateway is delivering reliable, scalable and manageable server technology at unprecedented prices.

Microsoft Choice

Gateway gives you the freedom to choose. We custom build every system after you order it, and we let you pick from the hottest Microsoft® and DreamWorks Interactive™ software around. Education CDs, productivity programs, games — it's all here.



GATEWAY BUSINESS DIRECT

Gateway's knowledgeable and friendly sales reps have taken their expertise to the next level. We formed a team of dedicated sales folks and gave them advanced training on servers, networking, GP-Series desktops and financing to better handle business customers' needs. Our Gateway Business Direct team is fired up to take your calls!

Boston Acoustics® MediaTheater™ Multimedia Sound System with Virtual Dolby® Surround

Ignite your senses with our new Boston Acoustics speakers. This quality sound system takes music and education CDs, computer games, even multimedia presentations to audio extremes. This compact, three-piece system has Dolby ProLogic® decoding and a digital Virtual Dolby Surround processor to recreate full five-speaker surround sound with just two speakers.



Financing For The Holidays And Always

Gateway makes owning your Gateway PC more affordable than ever before. Not only do we give you hot deals on systems, we also give you more options to finance those PCs. Low, fixed monthly payments, 90 days same as cash, your very own Gateway 2000 Moola MasterCard® or customized leasing — tell us what we can do to meet your needs.



Warm Up With Our New Web Site

Our Web site, www.gateway.com, is the place to be on-line. It's new and improved, simple to navigate, and full of answers to your questions. You can even buy your new holiday PC on-line. Sled to our Web site today!



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www.gateway.com



Take Gateway On Your Next Adventure

Whether you're traveling around the globe or across the hall, the GATEWAY™ Solo portable line has just the system to meet your needs. Gateway's tradition of packing in the features and delivering the performance goods continues with these mobile PCs.

The Gateway Solo 9100 portable is our top-of-the-line answer to your desktop needs in a "carry on." The August 4, 1997, edition of *Fortune* magazine calls the Gateway Solo 9100 "the Rolls-Royce of laptops, for folks who won't compromise on performance."

Our classic Gateway Solo 2300 notebook is just right for budget-conscious holiday shoppers. It's a perfect complement to a desktop PC.

We personalize the technology by letting you decide what goes in your portable. Every Gateway mobile and desktop PC is built fresh after the order. And common modularity is every IS manager's holiday wish! Many Gateway Solo components, including docking stations, batteries, memory and more, are designed to easily swap between our different models.

No other computer company gives you more computing, more places *and* more choices. Why not order your Gateway Solo right now? Stop by our Web site or give us a call.



Gateway Solo 9100XT
Portable PC



Gateway Solo 2300LS
Portable PC

Gateway Solo™ Portable PCs

2300SE

- 12.1" SVGA DSTN Color Display
- Intel® 166MHz Pentium® Processor with MMX™ Technology
- 16MB SDRAM (expandable to 192MB)
- 256K Pipelined Burst Cache
- 128-Bit Graphics Accelerator w/ 64K Colors
- Modular 7X min/11X max CD-ROM Drive
- Modular 3.5" Diskette Drive
- 2GB Hard Drive
- NiMH Battery & AC Pack
- USB Ports & Zoomed Video
- NTSC/PAL Video Output
- Integrated 16-Bit Sound & Stereo Speakers
- 85-Key MS® Windows® 95 Keyboard
- Carrying Case
- Microsoft® Windows 95
- MS Works 95
- LapLink® for Windows 95
- McAfee® VirusScan
- Gateway Gold™ Service & Support for Portable PCs

\$2099 As low as* \$73/mo.

*Gateway Solo 2300, Windows Sources
Stellar Award, October 1997*

9100XL

- ▶ 13.3" XGA TFT Color Display (1024 x 768 resolution)
- Intel 233MHz Pentium Processor with MMX Technology
- 64MB SDRAM (expandable to 192MB)
- 512K Cache
- 4MB EDO Video RAM (1280 x 1024 external resolution)
- ▶ Removable Combo 8X min/20X max CD-ROM & 3.5" Diskette Drive (allows for second battery pack)
- 5GB Hard Drive
- Two 12-Cell Lithium Ion Batteries & AC Pack
- External Battery Charger
- USB Ports & Zoomed Video
- NTSC/PAL Video Input & Output
- 16-Bit Wavetable Sound & Yamaha Stereo Speakers
- 33.6 Data/14.4 Fax PC Card Modem with x2™ Technology & Cellular Support**
- Full 88-Key MS Windows 95 Keyboard
- 15-Pin MIDI/Game Port
- Deluxe Carrying Case
- Gateway Solo Mini Docking Station
- MS Windows 95 & MS Office 97, Small Business Edition plus Bookshelf 97
- LapLink for Windows 95
- McAfee VirusScan
- Gateway Gold Service & Support for Portable PCs

\$5299 As low as* \$184/mo.

*Gateway Solo 9100, PC Magazine
Editor's Choice, August 1997*

2300LS

- 12.1" SVGA TFT Color Display
- Intel 200MHz Pentium Processor with MMX Technology
- 24MB SDRAM (expandable to 192MB)
- 256K Pipelined Burst Cache
- 128-Bit Graphics Accelerator w/ 64K Colors
- Modular 7X min/11X max CD-ROM Drive
- Modular 3.5" Diskette Drive
- 2GB Hard Drive
- 12-Cell Lithium Ion Battery & AC Pack
- USB Ports & Zoomed Video
- NTSC/PAL Video Output
- Integrated 16-Bit Sound & Stereo Speakers
- 85-Key MS Windows 95 Keyboard
- Carrying Case
- MS Windows 95 & MS Office 97, Small Business Edition plus Bookshelf® 97
- LapLink for Windows 95
- McAfee VirusScan
- Gateway Gold Service & Support for Portable PCs

\$2999 As low as* \$104/mo.

Gateway Extras

(Some items only available to new or existing Gateway customers or with the purchase of a PC.)

- Auto/Airline Adapter **\$99**



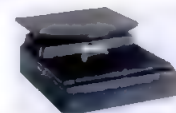
- Gateway Solo Mini Docking Station **\$199**

- 33.6 Data/14.4 Fax PC Card Modem** (with cellular support) **\$200**

- Additional 2300/9100 Lithium Ion Battery **\$200** (with system purchase)



- Canon® BJC®-80 Color Bubble Jet Printer **\$299**



- Gateway Solo Docking Station **\$599**

**Maximum data transfer rate dependent on certain variables including particular modems with which you are communicating, telephone lines, communications software and communications protocols.



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www.gateway.com



Gather 'Round The Future Of Digital Media

The powerful computer features and digital television capabilities of our new Destination Digital Media Computers (DMC) have tamed the flames of the digital future.

Entertainment and information will never be the same.

The DMC, descendant of the Destination Big Screen PC/TV, is a big hit with digital pioneers. Enormous 31-inch or 36-inch (35.5-inch viewable) SVGA monitors give the whole gang a great view. Imagine sitting 10 feet away and still being able to read text on the screen! Amazing digitally enhanced television is displayed at resolutions up to 640 x 480. And the clarity of this monster monitor is unbelievable — 3-D practically jumps off the screen thanks to the Apocalypse 3Dx graphics accelerator.

Digital Versatile Disc (DVD) cranks up your experience with improved quality and more storage: seven times as much as a CD. Plus it supports two surround-sound standards: Dolby® Digital and Dolby Pro Logic®. The precision of our harman/kardon speaker system takes Dolby Pro Logic to extremes!

Our Destination systems give you independence that goes far beyond the cordless keyboard and Field Mouse remote. Don't be left out in the cold. Get yours today.



Gateway Destination DMC-4000

Digital Media Computer

For more information, visit us at www.destination.com

Cordless Keyboard and Field Mouse® Remote

Multidirectional, 4-Channel Radio Frequency

• 25' range • Control Buttons: Power, Volume, Channel, Mute and Recall • TV/PC control

• **Keyboard Specifics:** 4 AA Batteries (included), 87 Alpha-numeric keys and Microsoft Windows 95 key, EZ Pad touch pad, PS/2® Mouse Port

• **Remote Specifics:** 4 AAA Batteries (included), Left and Right Mouse Buttons, Easy-Access Mouse Button on Back, Integrated Trackball, Numeric Keypad

31-inch SVGA Monitor

Data Grade CRT: 33" Diagonal (31.5" viewable)

• Invar Shadow Mask • Resolution: 640 x 480 @ 60-72Hz, 800 x 600 @ 60Hz • Unlimited Display Colors • Scanning Frequency: Horizontal, 31 to 38kHz; Vertical, 50Hz to 72Hz

36-inch SVGA Monitor

Data Grade CRT: 38" Diagonal (35.5" viewable)

• Invar Shadow Mask • Resolution: 800 x 600 @ 60Hz • Unlimited Display Colors • Scanning Frequency: Horizontal, 31 to 37kHz; Vertical, 59Hz to 75Hz • Autoswitching PC/TV Mode

Digital TV Capabilities

Digital Line Doubling, Progressive Scan • Digital Comb Filter • Two-tap Vertical Line Interpolation • Five-tap Horizontal Line Interpolation • Brooktree 2164 Graphics Chip • 829a Video Decoder • 181-Channel, Cable-Ready TV/Tuner

harman/kardon® Home Theater Surround Sound System

AVR-10 Audio/Video Receiver w/ Remote

• Frequency Response: 0.5Hz-100kHz @ 1W (+0/-3dB) • Signal-to-Noise Ratio: CD - 93dB; Video - 83dB • Four 3.5" Paper-Cone Satellite Speakers • Center Channel w/ 3.5" Paper-Cone Woofers (2) and .5" Polycarbonate-Dome Tweeter w/ Acoustic Lens in D'Appolito configuration, and 50W specially designed 6.5" Paper-Cone Subwoofer



The crisp, clear images of DVD on the Destination Digital Media Computer make analog video as unpopular as coal. (Television horizontal resolution calculated assuming a composite video signal.)



800-270-5733

www.gateway.com

*Destination 31-inch and 36-inch monitors are covered by a one-year limited warranty. Call or write for a free copy.

GATEWAY™ Destination® Big Screen PC/TVs

D5-166

■ Intel® 166MHz Pentium® Processor with MMX™ Technology • 32MB SDRAM • 512K Pipelined Burst Cache • 31" SVGA Monitor • 2GB 11ms Ultra ATA Hard Drive • 12X min/24X max CD-ROM Drive • Boston Acoustics® MicroMedia™ 3-Piece Speaker System

\$2499 As low as* \$87/mo.

D6-233

■ Intel 233MHz Pentium® II Processor with 512K Cache • 64MB EDO DRAM • 31" SVGA Monitor • 4GB 11ms EIDE Hard Drive • DVD-ROM Drive with Hardware MPEG2 and AC3 Decoding • harman/kardon Dolby ProLogic Sound System

\$3999 As low as* \$139/mo.

Gateway Destination DMC—

D6-300XL

■ Intel 300MHz Pentium II Processor with 512K Cache • 64MB EDO DRAM • 36" (35.5" viewable) Multimode SVGA Monitor • 4MB Apocalypse 3Dx Graphics Accelerator • 8.4GB 8.5ms EIDE Hard Drive • DVD-ROM Drive with Hardware MPEG2 and AC3 Decoding • harman/kardon Dolby ProLogic Sound System

\$4999 As low as* \$174/mo.

All Destination Systems Include:

- 2MB 2-D Graphics with Multiple Input Digital TV Tuner
- 3.5" Diskette Drive
- 32 Voice Ensoniq® Wavetable Digital Sound
- TelePath® Modem for Windows with x2 Technology™
- 7-Bay Charcoal-Colored PC Case
- Cordless Keyboard w/ EZ Pad® Pointing Device
- Cordless Field Mouse Remote
- Microsoft® Windows® 95
- ▶ Microsoft Choice Software
- Gateway Gold™ Service & Support* for Big Screen PC/TVs

Gateway Extras

(Some items only available to new or existing Gateway customers or with the purchase of a PC.)

- Microsoft SideWinder® Joystick \$59
- EasyPhoto Drive™ Color Photo Scanner \$129
- Epson® Stylus® COLOR 800 Ink Jet Printer \$399
- 31-Inch SVGA Monitor \$849 (with system purchase)

Make Your Network Connection At Gateway

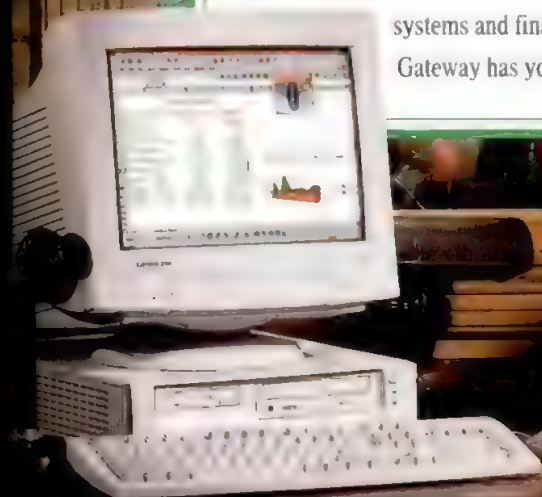
Gateway's servers and network-ready PCs have arrived. We have all the right products, systems and people in place to take business to the next level. And you're the conductor, because we're here to meet your needs. The addition of Gateway Business Direct, NS-Series servers and GP5-166E desktops means now our business customers can count on the personalized service, fresh technology and outstanding value that made Gateway what it is today: a leading direct-marketer of professional PCs.

Businesses have always turned to Gateway for the best overall value, and with the introduction of the GATEWAY™ NS-Series server line, we can do even more for your business.

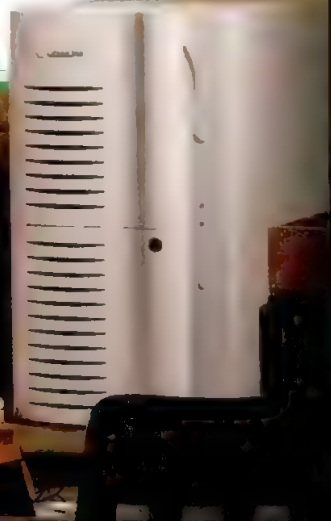
Our reliable NS-Series servers are based on proven technologies from ALR, a Gateway subsidiary. Trademarked ALR technology, like the InforManager subsystem with ActiveCPR, make our servers easier to manage. Plus they offer the scalability necessary to grow with your business.

The featured NS-7000 entry-level server is a great print and file server as well as a reliable network hub for workgroups, classrooms and small departments. Couple this savvy server with Gateway's low-cost, network-ready GP5-166E systems and our affordable financing options, and that network you've been considering becomes a reality.

Check out our Web site and get price quotes. Then call our Gateway Business Direct team so we can help you find the right systems and financing solution. Either way, Gateway has your network ticket.



GP5-166E Network-Ready Desktop PC



NS-7002 Server

Gateway *NS-Series Server*

NS-7002

- Intel® 233MHz Pentium® II Processor with 512K ECC (Error Checking and Correcting) Cache
- SMP-Compliant (Dual-Processor Ready) Supporting Up To Two Pentium II Processors (upgradable to 266MHz and 300MHz)
- 32MB EDO Memory (expandable to 512MB)
- ECC Memory System
- 4GB Ultra Wide SCSI-3 5,400 RPM Hard Drive
- Integrated Ultra Wide SCSI-3 Controller
- 12X SCSI CD-ROM Drive
- 3.5" Diskette Drive
- 3Com® 10/100 Twisted Pair Ethernet Adapter
- Three 32-Bit PCI, Two EISA, One PCI/EISA Slots
- 4 DIMM Slots
- EV500 .28 Screen Pitch 15" Monitor (13.9" viewable)
- Integrated 32-Bit PCI Graphics with 2MB DRAM
- Seven-Bay Server Tower Case with 325-Watt Power Supply, Includes five External Bays (three 5.25" and two 3.5") and two 3.5" Internal Bays
- 104+ Keyboard & Mouse
- Microsoft® Windows NT® Server 4.0 (1-4 CPUs, 10 User Licenses)
- ALR InforManager™ Server Management System with ActiveCPR™ Processor Protection (maintains processor thermals, cooling fan and voltage levels for additional security and reliability)

\$3653 Gateway GoldValue Lease® \$134/mo.

GATEWAY BUSINESS DIRECT

Gateway Extras for Servers

(Some items only available to new or existing Gateway customers or with the purchase of a PC.)

- 3-Channel ADAC RAID Card **\$1130**
- 3-Drive RAID Cage **\$100**
(requires 3-Channel ADAC RAID Card)
- Three 4.2GB SCSI SCA Drives **\$1955**
(requires 3-Drive RAID Cage)
- ADAC RAID Memory Upgrades
(Call for upgrade pricing.)
- 2nd Pentium II 233MHz Processor with 512K ECC Cache **\$730**
- 4GB Ultra Wide SCSI 7,200 RPM Hard Drive
9GB Ultra Wide SCSI 10,000 RPM Hard Drive
(Call for upgrade pricing.)

Gateway *GP-Series PC*

GP5-166E

- Intel 166MHz Pentium® Processor with MMX™ Technology
- 16MB SDRAM
- 256K Pipelined Burst Cache
- EV500 .28 Screen Pitch 15" Monitor (13.9" viewable)
- Integrated PCI Video with 2MB DRAM
- 2GB 11ms Ultra ATA Hard Drive
- 12X min/24X max CD-ROM Drive
- 3.5" Diskette Drive
- Integrated 16-Bit Business Audio
- Integrated 10/100 Ethernet Twisted Pair Adapter
- Low Profile Desktop Case
- 104+ Keyboard & Mouse
- MS® Windows® 95 & MS Office 97, Small Business Edition plus Bookshelf® 97
- Intel LANDesk® Client Manager 3.01
- Desktop Management Interface (DMI) 1.1 Compliant
- Gateway Gold Service & Support for GP-Series PCs

\$1299 Gateway GoldValue Lease® \$48/mo.

E-Series Systems

Large enterprise customers interested in volume purchases should contact Gateway 2000 Major Accounts, Inc. to learn more about the full line of Gateway E-Series desktop PCs, workstations and servers. 800-779-2000

Gateway Extras for Desktops

(Some items only available to new or existing Gateway customers or with the purchase of a PC.)

- 3Com PCI 10/100 TP Adapter **\$64**
- 16-Bit Token Ring Adapter **\$159**
- MS Windows NT Workstation 4.0 **\$99**
(upgrade from PCs that include MS Windows 95)
- 2GB 11ms Ultra ATA Hard Drive
4GB 11ms Ultra ATA Hard Drive
6.4GB 10ms Ultra ATA Hard Drive
(Call for upgrade pricing.)
- 4GB Ultra Wide SCSI 5,400 RPM Hard Drive
9GB Ultra Wide SCSI 10,000 RPM Hard Drive
(Call for upgrade pricing.)



800-270-5733

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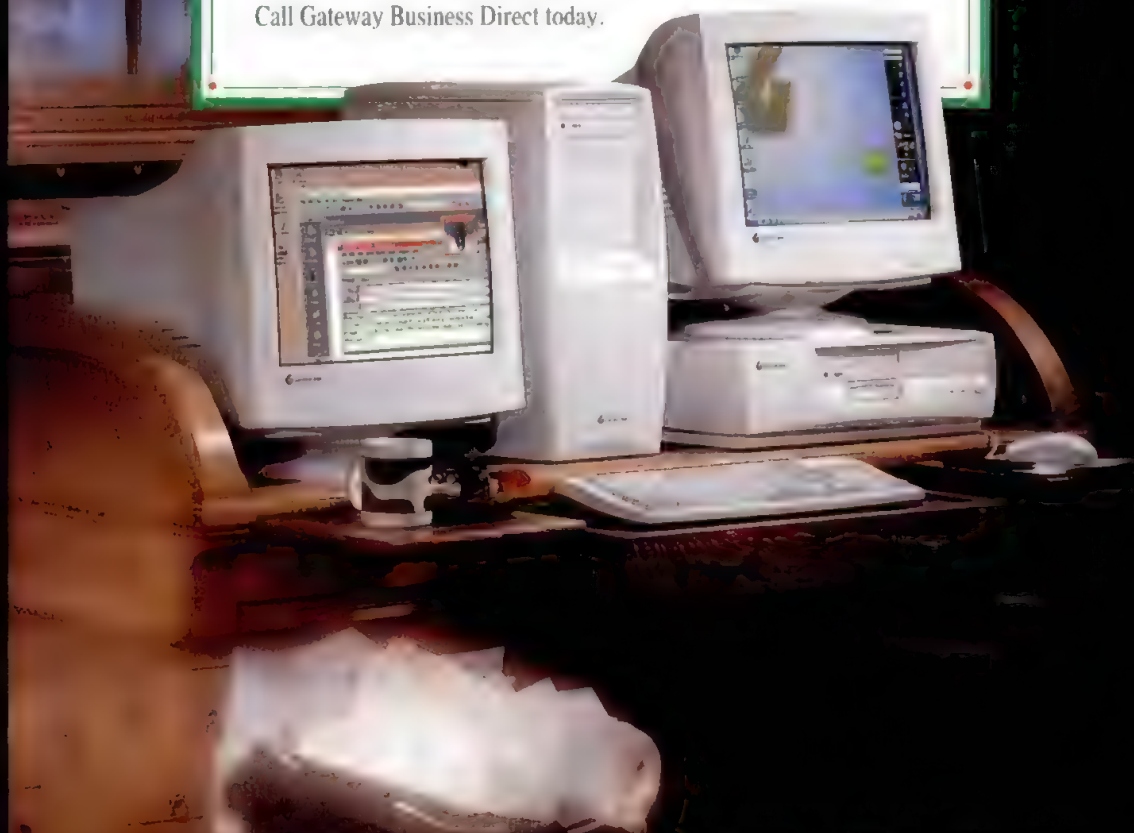
Gateway Business Direct Addresses Your Needs

As a leading direct PC supplier to the small business sector, Gateway can meet your business needs to the letter. Count on us to deliver the full package: educated sales people, quality-tested hardware and software, and award-winning toll-free technical support 24 hours a day. Plus, at www.gateway.com/smbus, you'll find informative articles, financing information and the opportunity to check out our products, get quotes on-line — even make your purchase if you'd like.

Gateway Business Direct gives you access to a well-trained sales force dedicated to business customers. So whether you have your own IS department, or you *are* the IS department, Gateway makes sorting through options and getting informed answers to computing questions easier than ever before.

We've also designed a product line just for business: GATEWAY™ GP-Series desktops. From high-performance, graphics and number-crunching machines to low-cost, network-ready systems, we give you the power and performance to take your business to new heights and keep it ahead of the technology curve.

Talk to someone who understands business as well as you do. Call Gateway Business Direct today.



Gateway GP-Series professional systems offer both mid-tower and desktop cases.

Gateway GP-Series PCs for Business

GP5-166

- Intel® 166MHz Pentium® Processor with MMX™ Technology
- 32MB SDRAM
- 512K Pipelined Burst Cache
- EV500 .28 Screen Pitch 15" Monitor (13.9" viewable)
- 2MB 3-D 64-Bit PCI Graphics
- 2GB 11ms Ultra ATA Hard Drive
- 12X min/24X max CD-ROM Drive
- 3.5" Diskette Drive
- GP-Series Desktop Case
- 104* Keyboard & MS® IntelliMouse™
- Microsoft® Windows® 95 & MS Office 97, Small Business Edition plus Bookshelf® 97
- Gateway Gold™ Service & Support for GP-Series PCs

\$1349 Gateway GoldValue Lease* \$48/mo.

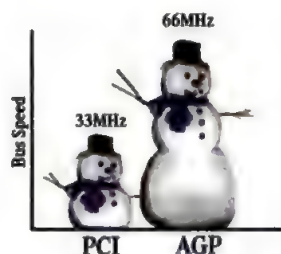
GP6-266

- Intel 266MHz Pentium II Processor with 512K Cache
- 64MB SDRAM
- EV700 .28 Screen Pitch 17" Monitor (15.9" viewable)
- ▶ nVidia 4MB 3-D AGP Graphics
- 8.4GB 8.5ms Ultra ATA Hard Drive
- 12X min/24X max CD-ROM Drive
- 3.5" Diskette Drive
- GP-Series Mid-Tower Case
- 104* Keyboard & MS IntelliMouse
- MS Windows 95 & MS Office 97, Small Business Edition plus Bookshelf 97
- Gateway Gold Service & Support for GP-Series PCs

\$2499 Gateway GoldValue Lease* \$89/mo.

E-Series Systems

Large enterprise customers interested in volume purchases should contact Gateway 2000 Major Accounts, Inc. to learn more about the full line of Gateway E-Series desktop PCs, workstations and servers. 800-779-2000



AGP, Intel's next-generation graphics system, widens the flow of data to the monitor creating smooth, fast video and sophisticated 3-D performance at twice the bus speed.



GP6-233

- Intel 233MHz Pentium® II Processor with 512K Cache
- 32MB SDRAM
- EV700 .28 Screen Pitch 17" Monitor (15.9" viewable)
- ▶ nVidia™ 4MB 3-D AGP Graphics
- 2GB 11ms Ultra ATA Hard Drive
- 12X min/24X max CD-ROM Drive
- 3.5" Diskette Drive
- GP-Series Mid-Tower Case
- 104* Keyboard & MS IntelliMouse
- MS Windows 95 & MS Office 97, Small Business Edition plus Bookshelf 97
- Gateway Gold Service & Support for GP-Series PCs

\$1999 Gateway GoldValue Lease* \$71/mo.

Gateway GP6-233, PC World Power Desktop, October 1997

GP6-300 BEST BUY

- Intel 300MHz Pentium II Processor with 512K Cache
- 64MB SDRAM
- ▶ EV900 .26 Screen Pitch 19" Monitor (18" viewable)
- ▶ nVidia 4MB 3-D AGP Graphics
- 8.4GB 8.5ms Ultra ATA Hard Drive
- 12X min/24X max CD-ROM Drive
- 3.5" Diskette Drive
- GP-Series Mid-Tower Case
- 104* Keyboard & MS IntelliMouse
- MS Windows 95 & MS Office 97, Small Business Edition plus Bookshelf 97
- Gateway Gold Service & Support for GP-Series PCs

\$2949 Gateway GoldValue Lease* \$105/mo.

Gateway Extras

(Some items only available to new or existing Gateway customers or with the purchase of a PC.)

- 3Com® PCI 10/100 TP Ethernet Adapter **\$64**
- TelePath® Modem for Windows with x2™ Technology™ **\$79**
- TR4 IDE 4GB Tape Backup Unit with Tape **\$199** (with system purchase)
- MS Windows NT® Workstation 4.0 **\$99** (upgrade from PCs that include MS Windows 95)
- Iomega® Internal ZIP™ Drive with Two Discs **\$99** (with system purchase)

GATEWAY BUSINESS
DIRECT



800-270-5733

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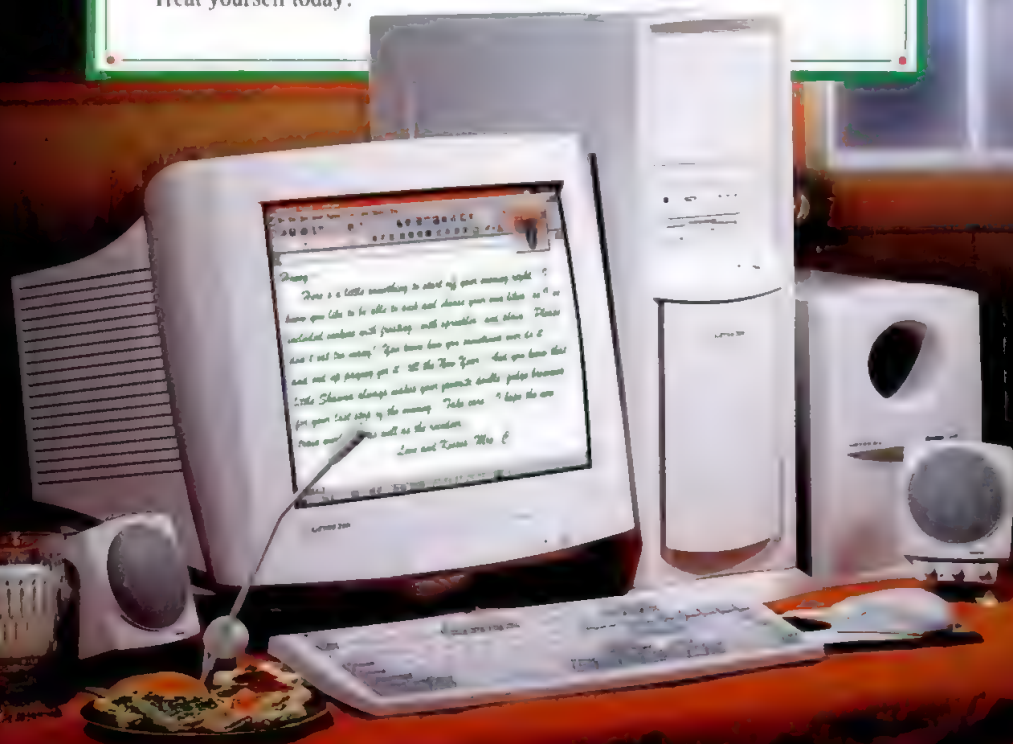
Desktop PCs For Business

PCs Made Especially For You

We're whipping up delectable multimedia performance and value. No one else comes close to having all Gateway's multimedia goodies.

We start off right by giving you a choice of software. Not just *any* software, it's all from Microsoft and DreamWorks Interactive. We joined forces with these creative, cutting-edge software and entertainment companies to create "Microsoft Choice" — four exceptional packages of top-selling software. You tell us which best meets your needs and we'll install it for you.

Of course we have the hardware to make all this amazing software really cook too. We've even found a way to deliver Intel's next-generation processor technology, the **Pentium® II** processor, for less than \$2,000! That's only \$70 a month, and you own the system the moment it arrives. Now the question isn't whether you can afford it, it's how could you possibly let this amazing opportunity pass by? Because the processor isn't the only cool thing on this system. It's loaded with all the frosting and sprinkles for amazing value. We've blended feature-packed systems, award-winning service and support, and great prices to make Gateway G-Series multimedia systems both irresistible and affordable. And each is unique because we make them after you order. Treat yourself today!



Gateway G6-300XL Multimedia PC with Boston Acoustics Media Theater Speakers
See our Software and Peripherals pages for more details.

Gateway G-Series Multimedia PCs for the Home

G5-166

- Intel® 166MHz Pentium® Processor with MMX™ Technology
- 16MB SDRAM
- 512K Pipelined Burst Cache
- EV500 .28 Screen Pitch 15" Monitor (13.9" viewable)
- 2MB 3-D 64-Bit PCI Graphics
- 1.6GB 12ms Ultra ATA Hard Drive
- 12X min/24X max CD-ROM Drive
- 3.5" Diskette Drive
- Ensoniq® Wavetable Audio
- Altec™ Lansing ACS-41 Speakers
- TelePath® Modem for Windows with x2™ Technology**
- G-Series Desktop Case
- MultiFunction Keyboard & Microsoft® Mouse
- MS® Windows® 95
- ▶ Microsoft Home Essentials Software
- ▶ Color Bubble Jet Printer
- Gateway Gold™ Service & Support for G-Series PCs

\$1499 As low as* \$52/mo.

PC World Best Buy August 1997

G6-300

- Intel 300MHz Pentium II Processor with 512K Cache
- 32MB SDRAM
- ▶ EV900 .26 Screen Pitch 19" Monitor (18" viewable)
- ▶ nVidia 4MB 3-D AGP Graphics
- 6.4GB 10ms Ultra ATA Hard Drive
- 12X min/24X max CD-ROM Drive
- 3.5" Diskette Drive
- Ensoniq Wavetable Audio
- Boston Acoustics MicroMedia 3-Piece Speaker System
- TelePath Modem for Windows with x2 Technology**
- G-Series Mid-Tower Case
- MultiFunction Keyboard & MS IntelliMouse
- MS Windows 95
- ▶ Microsoft Choice Software
- Gateway Gold Service & Support for G-Series PCs

\$2999 As low as* \$104/mo.

Gateway Extras

(Some items only available to new or existing Gateway customers or with the purchase of a PC.)

- EV900 .26 Screen Pitch 19" Monitor (18" viewable)
 - ▶ upgrade from EV500 \$400
 - ▶ upgrade from EV700 \$200
- Gateway Gold Premium Service and Support — an extended Three-Year On-Site Agreement** including priority 800 number for access to technical experts.
 - ▶ At time of system purchase \$99
 - ▶ Within current on-site service agreement \$129

G6-233 BEST BUY

- Intel 233MHz Pentium® II Processor with 512K Cache
- 32MB SDRAM
- EV700 .28 Screen Pitch 17" Monitor (15.9" viewable)
- ▶ nVidia™ 4MB 3-D AGP Graphics
- 2GB 11ms Ultra ATA Hard Drive
- 12X min/24X max CD-ROM Drive
- 3.5" Diskette Drive
- Ensoniq Wavetable Audio
- Altec Lansing ACS-41 Speakers
- TelePath Modem for Windows, with x2 Technology**
- G-Series Mid-Tower Case
- MultiFunction Keyboard & MS IntelliMouse™
- MS Windows 95
- ▶ Microsoft Home Essentials Software
- Gateway Gold Service & Support for G-Series PCs

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- ▶ DVD-ROM Drive & DVD Decoder Card
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- Ensoniq Wavetable Audio
- ▶ Boston Acoustics MediaTheater™ 3-Piece Speaker System
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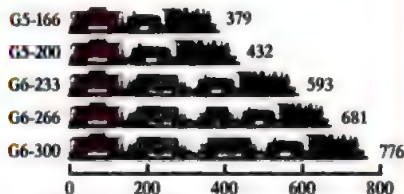
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G6-266

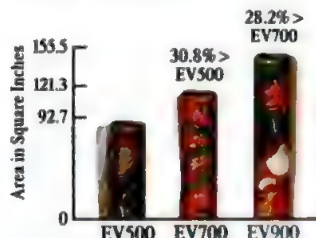
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CPUmark₃₂ is a 32-bit test that reflects the processor usage of 32-bit applications and focuses solely on a PC's CPU, RAM, cache and cache controller.

For more information on how these benchmark scores were achieved, please call the Gateway FaxBack® service and request document #2471. Benchmark information is also available on our Web site, www.gateway.com.



The EV900 increases your viewing area and has a smaller footprint than other 19-inch monitors. That means one less roll of wrapping paper this holiday season.

**On-site service is available to most locations in the continental United States, Alaska, Hawaii, Puerto Rico and Canada after you and your Gateway technician determine an on-site visit is necessary. On-site service is provided by PC Technology Services, Inc. On-site is not available for any monitor, mouse, keyboard, or portable system. Write or call for a free copy of the on-site service agreement.

Through a special arrangement with premier software developer, Microsoft, we've put together a trainload of top-of-the-line software — including titles from entertainment giant DreamWorks Interactive. You choose your standard software from four options, but we don't stop there. You can easily and affordably add more software to your PC as an upgrade. And, when you order extra software at the same time you order your system, we'll even load it for you.

Microsoft® Home Essentials

Microsoft Home Essentials comes standard on our special G5-166 and G6-233 Best Buy packages. All the essential tools for home computing are there, including: Word, Works, Encarta® Encyclopedia, Greetings Workshop and Arcade. Plus it's easy to add another specialty pack from our software upgrades. You won't find a better deal anywhere.



Microsoft Choice Options

Gateway G-Series PCs (except the G5-166 and G6-233 Best Buy), and all GP-Series PCs and Destination systems, let you continue to personalize your PC with Microsoft Choice. Look over the following packages and tell us which one best meets your needs. Microsoft Office 97, Small Business Edition does not include Microsoft Home Essentials, while the other three suites do.

■ Microsoft Office 97, Small Business Edition

Get organized and get connected with the office suite that integrates intelligent, productivity-enhancing applications with the power of the Internet. Includes Microsoft Excel, Word, Publisher, Bookshelf®, Small Business Financial Manager and Outlook™.



■ Microsoft Professional Resource Suite Plus Microsoft Home Essentials

Increase your productivity and efficiency with volumes of information at your fingertips. Award-winning content and interactive environments are combined in these easy-to-use applications. Includes Publisher, Bookshelf, Encarta Virtual Globe, Expedia™ Streets and Expedia Trip Planner.



■ Microsoft Action Titles Plus Microsoft Home Essentials

Experience incredibly realistic graphics, explore new worlds and tackle tough challenges with these action-packed games. Includes Close Combat™; Flight Simulator; Age of Empires™; Monster Truck Madness™; DreamWorks Interactive™: DILBERT'S™ Desktop Games; and DreamWorks Interactive: The Neverhood™.



■ Microsoft Child Adventure Suite Plus Microsoft Home Essentials

Kids love these educational and entertaining software titles designed to encourage adventure and exploration. You'll appreciate the parental control and PC security features. Includes Microsoft Plus! For Kids; DreamWorks Interactive: Chaos Island: The Lost World™; DreamWorks Interactive: Goosebumps™: Attack of the Mutant™ 98; Scholastic's The Magic School Bus™ Explores in the Rain Forest; MS 3-D Movie Maker; Scholastic's The Magic School Bus Explores in the Age Of Dinosaurs and Creative Writer 2.



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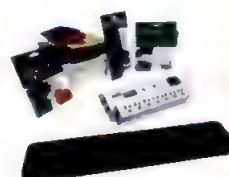
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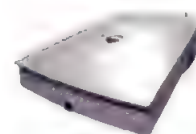
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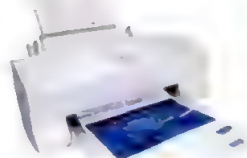


Hewlett-Packard ScanJet 5Pse Color Scanner

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Trends Peripherals

LCD MONITORS

Desktop Space-Savers

Although still too expensive for the average corporate consumer, flat-panel LCD screens are slowly coming down in price. These monitors offer brilliant, flicker-free images and take up minimal desktop real estate. Here are some of the latest offerings in this fast-growing high-end market.

MAG Innovation Co. (800-827-3998, www.mag-innovation.com) has unveiled its 15-inch **LS500C** (\$2,050 street), a pivoting DSTN dual-scan monitor that can display images in landscape or portrait mode. Just turn the monitor on its axis and reset the screen to shift the polarity for a full-size, WYSIWYG view of your documents. The extra depth of the portrait orientation is ideal for word-processing documents and Web pages.

Capable of 1,024-by-768 resolution at a 120-Hz refresh rate, the LS500C has a 0.3-mm RGB stripe pitch and a 300-ms response time for smooth video. User controls allow for adjustment of brightness and contrast. This Plug-and-Play-compatible monitor also comes with a PCI interface card that must be installed into the attached computer; the card has 2MB of on-board EDO DRAM and a built-in LVDS interface.

Panasonic Computer Peripherals Co. (800-742-8086, www.panasonic.com/alive) also has a flat-panel screen on the market. Only 2 inches thick and weighing 12.1 pounds, the **PanaFlat LC40** (\$2,800 street) has a 14-inch diagonal viewing area and is capable of 1,024-by-768 resolution at 16.7 million colors. The TFT active-matrix screen has a dot pitch of 0.28 mm. On-screen controls allow you to customize 14 functions—including size, geometry, and color—in five different languages.

Another giant throwing its hat



FLAT-PANEL BRILLIANCE: Samsung's SyncMaster and MAG's swivel-mounted LS500C.

into the LCD ring is Philips Electronics (800-835-3506, www.philips.com). The company's new **Brilliance 4500AX LCD** monitor sells for \$2,500 (street price) and has

an active-matrix TFT screen with a 0.29-mm horizontal pitch. The Brilliance 4500-AX can display 1,024-by-768 mode

at a 75-Hz refresh rate.

A built-in analog interface makes the Brilliance LCD compatible with standard video cards, and the user adjustments allow you to customize several modes and parameters or even use an automated setup routine that selects the best choices for your purpose. The monitor is Plug-and-Play-ready and boasts zero radiation and flicker. It is compatible with Apple, Unix, and Windows interfaces.

ViewSonic (800-888-8583, www.viewsonic.com) is

RECAP PC Magazine reviewed five desktop LCDs in our issue of September 9, 1997. The Editors' Choice winner was the NEC MultiSync LCD400.

now offering its **VP140 ViewPanel** (\$2,200 street), a 14-inch-viewable active-matrix TFT

screen that weighs 12.1 pounds—including a detachable pedestal—and is 2.5 inches thick. It is capable of 1,024-by-768 resolution at a 75-Hz refresh rate with 16.7 million colors. The monitor is compatible in both PC and Mac formats.

Samsung Electronics America (800-933-4110, www.samsung.com) is currently shipping its **SyncMaster 400TFT** (\$2,380 street), a sleek, charcoal-gray LCD TFT panel with a 0.27-mm dot pitch. Capable of 1,024-by-768 resolution at 60 Hz, it is just over 2.5 inches thick (8 inches with base) and contains two stereo speakers and a microphone.—Josh Levy

MASS STORAGE

Tape Goes Mainstream

Tape drives keep getting faster and more affordable, making them increasingly attractive to home and small-business users.

Hewlett-Packard Co. (800-826-4111, www.hp.com) expands its family of tape drives with two new units: the **HP SureStore T4** and the **HP Colorado 5GB**. The SureStore T4 (\$400 street for internal, \$500 street for external) can store up to 4GB of data (8GB compressed) at

a 60MB-per-minute transfer rate. It has a SCSI-2 interface and conforms with the QIC-3095 standard format, which makes it compatible with TR-4 (Travan-4) and QIC-wide mini-cartridges.

The SureStore's sibling, the Colorado 5GB, can save up to 3GB of data in 30 minutes and has a transfer rate ranging from 40MB to 55MB per minute. It supports a broad range of Travan and QIC

DET IT ON TAPE: New offerings from HP and Tecmar.



media and is available in two models: an internal IDE version (\$200 street) and an external parallel-port version (\$250 street).

Newly available from AIWA America (714-862-0200, www.aiwa.com) is the sleekly designed **TD-AS3220** (\$190 street), the first double-speed TR-3 tape drive. Its backup speed peaks at 38MB per minute, and the drive provides up to 3.2GB of compressed storage capacity on a single TR-3 mini-cartridge—or up to 4.4GB with a Verbatim QIC-EXtra tape.

Tecmar Technologies (800-422-2587, www.tecmar.com) also joins the fray with its **TS420 Travan NS** drive (\$385 street). The Tecmar provides 4GB of storage (or 8GB compressed), with a transfer rate of 1.2MB per second.—Roderrick A. Beltran

NETWORK LASER PRINTERS

New Laser Jets from HP

Now unveiling its new line of network printers is Hewlett-Packard (800-752-0900, www.hp.com). The **LaserJet 4000** series, which replaces the company's popular LaserJet 5 family, consists of 17-ppm printers that come standard with



PostScript Level 2 compatibility and HP's Web JetAdmin 3.0, an intranet-based management package that allows for installation, configuration, and status checks on all of your LAN's printers in a graphical format. HP will offer the LaserJet 4000 in four configurations, ranging in price from \$1,100 to \$1,600.—JL

INTERNET FILTERING

Covering Junior's Eyes

Since the Communications Decency Act was ruled unconstitutional last summer, software-based solutions have become the preferred methods of monitoring and blocking children's Internet activity. Two new products and a new version of one of the established leaders in this market aid parents in regulating their children's online experiences.

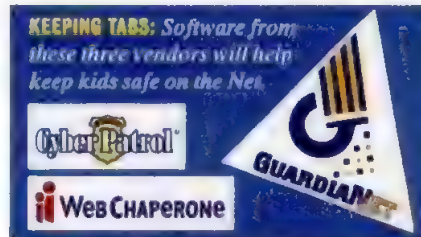
Microsystems Software's **Cyber Patrol** (800-828-2608, www.cyberpatrol.com), a past Editors' Choice winner, has released Version 4.0 of its product. The new version offers a tutorial for parents (to alleviate any setup concerns) and complicated features. Previous versions offered weekly updates to the CyberNOT list of restricted sites. That

list is now automatically enhanced daily, indexing objectionable sites compiled by a full-time research staff. Intelligent sensors detect and block sites with inadmissible words, phrases, or images. Meanwhile, human monitors catch any slip-ups, so sites devoted to Anne Sexton and breast cancer won't make it to the CyberNOT lists. Parents can add and remove inadmissible categories and sites themselves.

Pricing begins at \$29.95 for a three-month trial subscription. Subsequent rates are \$29.95 for twelve months.

WebCo International's **WebChaperone** (800-387-8373, www.webchaperone.com)

.com), utilizes a different approach that does not rely on rating systems or site lists. Rather, with **iCRT** (Intelligent Content Recognition Technology), Web-



Chaperone evaluates sites as they load. If necessary, WebChaperone blocks them and suggests alternative, acceptable sites for browsing. **iCRT** scans the pages' headers and entire content, so list-updating is unnecessary. As with CyberPatrol, WebChaperone's preferences may be modified for each user in a house-

hold. WebChaperone charges a one-time fee of \$49.95 for use of the service.

GuardianNet, from Landmark Community Interests, LLC (800-952-2452, www.guardianet.net), is a network-based proxy server that solves the issue of updating site lists by doing it automatically. Internet content is filtered by context rather than merely keywords, so it too can distinguish worthwhile sites from potentially offensive material. GuardianNet lets parents control Internet access by blocking sites based on one or a combination of predetermined categories, and it can also be customized for each family member. The software package is priced at \$59.95 with a three-month trial subscription. The additional yearly rate then begins at \$35.—Stephanie Lindenbaum

RECAP We reviewed seven Internet filtering packages in the issue of April 8, 1997. CyberPatrol 3.1 and Cyber-sitter 2.1 were given Editors' Choice awards.

WEB GUIDES

Web Cities

As the Web continues to offer services that make it more relevant to our daily lives, the creative growth in the market for local services continues. Here are two new efforts that expand on the traditional online-guide effort.

One comes from Cox Interactive Media (404-572-1800, www.cimedia.com). Rather than serving as a standard entertainment guide, Cox's **City Sites** are more community-related, offering forums for community discussion and local news; usually, City Sites are centered around an established media property, such as one of Cox's newspaper holdings. Eleven of these sites are running now, including San Francisco (www.bayinsider.com) and Atlanta (www.accessatlanta.com).

Community members can use

their local site to post messages on bulletin boards or chat with each other. The Cox sites also feature "scouts," local personalities who offer expert opinions.

By the time you read this, CIM will have launched its San Diego site, which will be the first of these with dual access both on the Internet and via @Home. CIM is working with @Home to produce its own brand of local sites via @Home's cable Internet

access—broadband's capacity for graphics adds interactive features to the sites when accessed through @Home. At this time, CIM has created @Home exclusive sites for Phoenix, AZ, and Orange County, CA, but eventually all the CIM city sites will provide dual access.

City.com, from the online yellow pages Zip2 (www.zip2.com), should launch by the time you read this. Representing an ex-

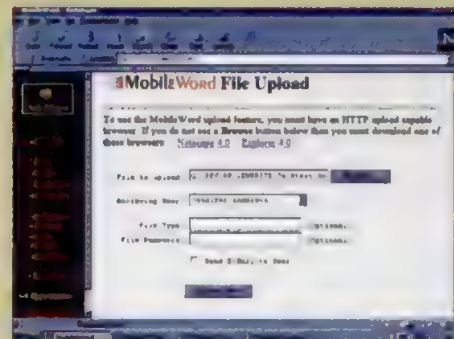
cution of the promise of integrated local services, City.com uses content from over 100 newspapers that Zip2 has partnered with. City.com will integrate several of Zip2's existing guide products into one navigable guide for all of them. The Real Estate Guide, the Auto Guide, and the City Guide will all be accessible through City.com for an easy way to access all of your local resources.—Jennifer L. Anderson

INTERNET FILE TRANSFER

Safe Passage

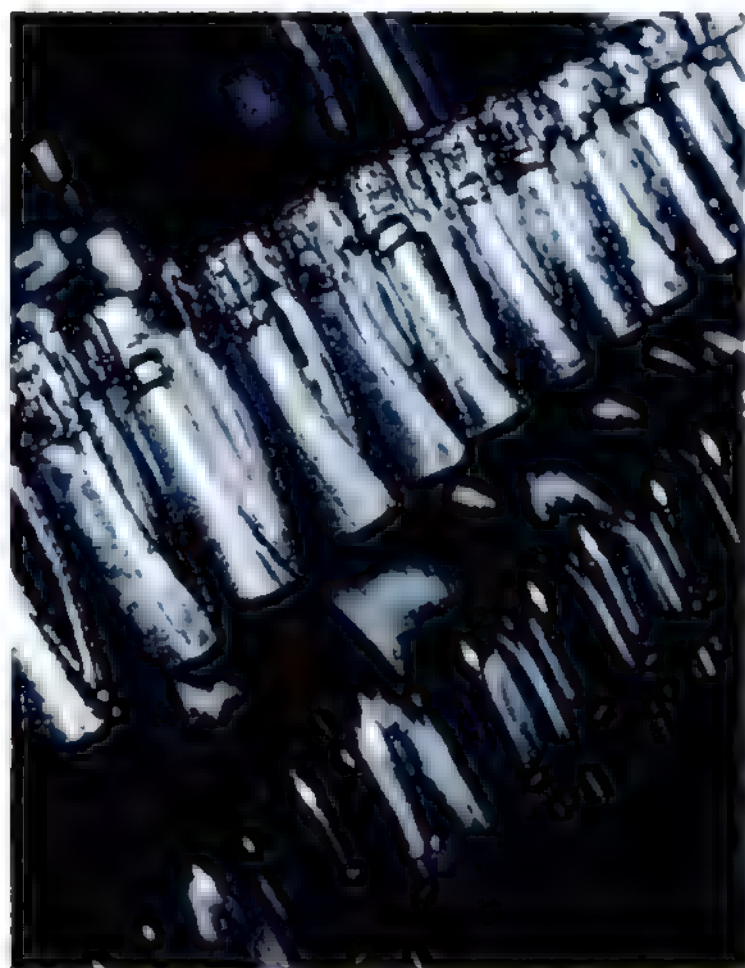
When you transfer lots of files via e-mail, you are probably all too aware of the problems of scrambled e-mail attachments and gateway delays, which frequently plague working this way. MobileWord Communications (888-286-6245, www.mobileword.com), the makers of TalkText, a pay-per-page online office support service that provides dictation formatting on demand, have added a new service to their suite.

FileTransfer lets users pass documents through the MobileWord Web site. Register for free with MobileWord and you'll be able to use the service to upload files to its server. An e-mail message will be automatically sent to recipients, notifying them to pick up the file at the site. Once there, recipients will click on Get File. If they are not registered with MobileWord, the information that they are prompted to enter will set them up automatically. By the time you read this, the full version of FileTransfer should be up and running.—JLA

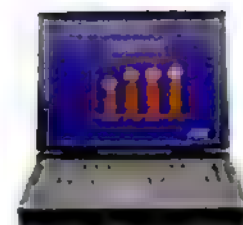


RECAP We reviewed ten Web regional guides in our issue of August 1997. CitySearch was our Editors' Choice award winner.

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Microsoft® Windows® 95 or
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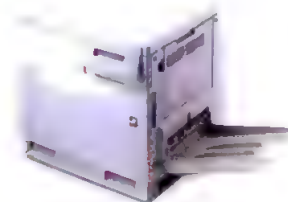


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FIREWALLS

A Firewall for Every Need

For most of us, the word "firewall" connotes a big, scary product that runs on Unix and costs tens of thousands of dollars. But over the past year or so, this traditional definition has become obsolete. Windows NT-based firewalls have begun to crowd the market, as have firewalls tailored to fit specific business situations.

Going after the corporate intranet market is CyberGuard Corp. (800-666-4273, www.cyberguardcorp.com), which recently released its **CyberGuard IntraNT Firewall** (starting at \$2,495 list price for 25 users). CyberGuard IntraNT Firewall includes the ability to block Lotus Notes and database-application traffic and is designed to protect the corporate intranet from internal

threats. It has proxies for commonly encountered network services, such as HTTP, FTP, POP3, SNMP, Lotus Notes, and Oracle's SQL and SQL*Net.

To define which services can be accessed by users, you set up user-specific profiles. IntraNT uses the Windows NT Security Domain database to define global user access, so network administrators do not need to spend time re-entering user names and the corresponding authentication data.

The product also has an optional SecureGuard for NT (\$495 list), which provides even tighter security for the Windows NT platform. SecureGuard can restrict user access to system re-

sources and the Windows NT Registry, prohibit the booting of non-Windows NT operating systems, and disable unused, unknown, and unsecured network services and subsystems.

WatchGuard Technologies (206-521-8340, www.watchguard.com) is reaching for the lower end of the spectrum with its turnkey **Firebox 100** (\$3,995), a product designed for businesses and organizations that either do not have an IS department or have only a small one.

The Firebox 100, which is billed as a network security appliance, is a hardware-based firewall

that comes with three 10/100-Mbps ports. This lets it sit by your router, trusted network, and any bastion servers you might have.

Besides blocking unwanted traffic in and out of your network, inspecting e-mail for possible hacker commands, and inspecting various ActiveX, Java, and PostScript downloads, the product also offers network address translation (NAT). When two or more Firebox 100s are connected, they create their own virtual private network (VPN).

Managing the Firebox 100 is done through its Security Management System (SMS), which can run on any Windows 95, Windows NT, or Linux client with a Pentium class processor. SMS lets you visually inspect network traffic and usage, and it will alert you when the network is under attack or is being scanned by a hacker.—Robert Daly



ON FIRE: WatchGuard Technologies' Firebox 100 turnkey solution.

TELEPHONY

IP Calling

Saving a little money on your corporate long-distance telephone bill is good, but saving a lot of money is better. One way to do so is by leveraging the Internet and your IP network to carry voice traffic. Many telephony vendors are currently unveiling solutions to assist you in this endeavor.

Array Telecom (416-736-0901, www.telecom.array.ca) and e-Net (301-601-8700, www.datatelephony.com) are two companies trying to carve a niche for themselves in this space ("Voice Across the Internet," October 21, 1997).

Geared toward ISPs and other carriers is Array Telecom's **TeleGate 2.0**, which consists of TeleGate Portal software (\$50 list) and the TeleGate Gateway server card (starting at \$5,000 list). The TeleGate Gateway uses digital signal processors (DSPs) to convert analog voice traffic into a digital stream, and it supports



YOU MAKE THE CALL: The new TelSet PC Card can help bring voice to your PC.

various Dialogic interface cards.

A special feature called Minute Bartering allows other TeleGate Gateways to terminate

calls in your local dialing area in exchange for credits. Credits can be either exchanged for access to the originating TeleGate Gateway or applied toward billing.

e-Net's Telecom 2000 product family focuses on supplementing your corporate PBX. The **TelSet PC card** (\$549 list) sits on your desktop and

lets you connect to your LAN and phone line simultaneously. This ISA bus card comes with an RJ-11 port (to connect your

telephone line), an RJ-45 port (to connect your 10Base-T Ethernet LAN), and a headphone jack. To make LAN-to-LAN connections, e-Net also offers Telecom 2000 central office gateway cards (\$749 list) with various analog central office, ATM, Digital Tie Line, and ISDN interfaces.

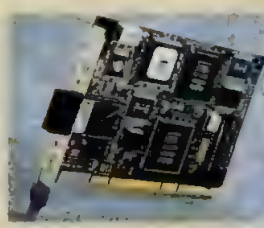
TelSet's management software, which can run on Windows 95 or Windows NT, provides users with all the regular PBX abilities: Call Waiting, Call Forwarding, conference calling, caller ID, last number redial, and voice-activated speed dialing.—RD

ATM

Traveling Ahead of the Pack

With all the talk going on about Gigabit Ethernet, many people have forgotten that we already have the technology in the asynchronous transfer mode (ATM) standard. FORE Systems (888-404-0444, www.fore.com), a long-time ATM player, recently released its **ForeRunner HE622** network adapter (\$2,995), which provides 622-Mbps throughput.

The ForeRunner HE622 offers 32/64-bit and 33/66-



MHz PCI bus support, dynamic burst sizing, multiple interrupt capabilities, and TCP check-sum calculation. All of these features streamline the interaction with the server's hardware and provide increased performance. When multiple cards are used in concert, they can provide over 2-Gbps throughput to

a single IP address by using advanced load-balancing and fail-over capabilities.—RD

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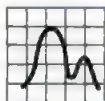
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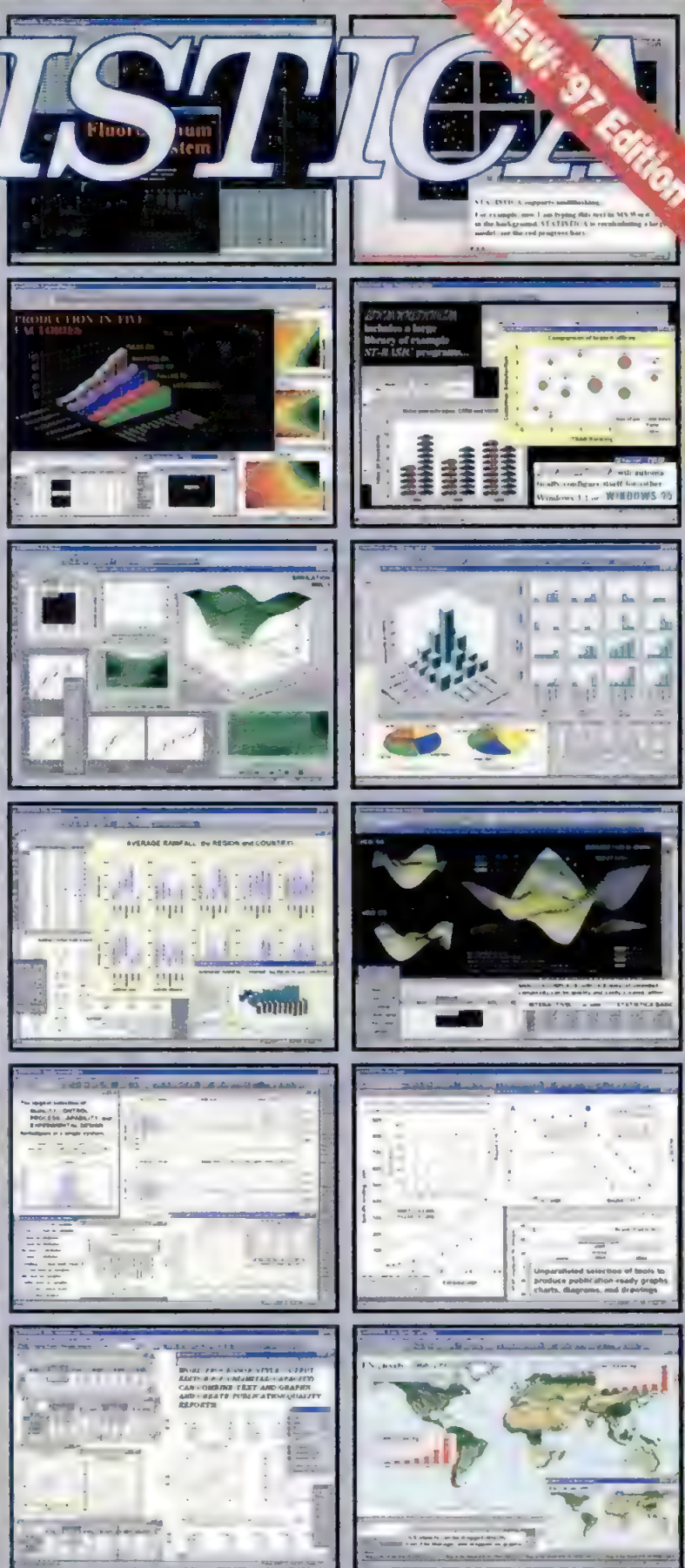
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First Looks



Paths to Knowledge

Seven new CD-ROM encyclopedias each bring something different to the table.

By Craig Stinson

If you have ever been in love with the aroma, sturdy binding, and imposing physical presence of a printed encyclopedia, you may be reluctant to trade it all in for two ounces of pitted aluminum in a flimsy plastic box. But set that reluctance aside: The CD-ROM-based encyclopedia is not only more portable and far less expensive than its paper counterpart, it is also much more useful.

Multimedia content aside, high-speed electronic searching and single-click cross referencing have rendered the old medium obsolete. If you mix in sound and video (which bring immediacy and reality to concepts and events as text alone could never do), you can see why all the encyclopedia action now revolves around a slim, shiny disk.

This year the action is more intense than ever before. In fact, "more" is the operative word for describing 1998's field of encyclopedia contenders. There are now more products, thanks to the debut of Collier's Encyclopedia 1998. And all of the vendors whose encyclopedias we reviewed earlier this year (First Looks, "CD-ROM Encyclopedias," March 4, 1997) have increased the quantity of text and multimedia in their products.

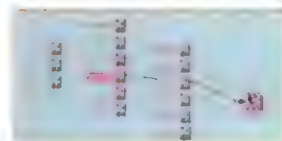
All of the vendors have also put considerable thought and energy into making their products more alluring and entertaining than ever before. Even the stately old Encyclopaedia Britannica has at last abandoned its traditional pure-text format in favor of a two-disk multimedia presentation complete with noisy splash screen.

THE PLAYERS

This year, we review seven encyclopedias: Britannica CD 98 Multimedia Edition, Collier's Encyclopedia 1998, Compton's Interactive Encyclopedia 1998, Encyclopedia Americana 1997 Edition, Grolier Multimedia Encyclopedia 1998, Microsoft Encarta 98 Encyclopedia, and World Book 1998 Multimedia Encyclopedia. Four of these—Grolier, Compton's, World Book, and Encarta—now come in standard and deluxe versions (where applicable, we reviewed the deluxe editions).

The first thing you should know when shopping for a CD-based encyclopedia is this: Unless cost is a paramount issue or you absolutely can't stand swapping disks, it makes no sense to buy one of the standard editions. Going on the cheap will cost you more than half the fun and value. In some cases, you will also lose the ability to pull monthly updates down from the Internet (this is true for Compton's, World Book, and Encarta).

INSIDE



SITE SEEING:

If you build your Web site with Microsoft FrontPage 98, people will come. See page 56 for the review.



DVD GETS SOFT:

Compaq's Presario 4850 hits home with SoftDVD. See page 60 for the full review and sidebar.

THINKING MOBILE:

IBM adds a 233-MHz mobile processor to the new ThinkPad 560X. For the review, see page 68.



RAIDING THE DESKTOP:



HP takes the Win NT workstation market by storm with the brand new Kayak XU. See page 68.

More Products Reviewed ...

Sony PCV-220.....	60
SynCrypt 1.0.....	64
FileMaker Pro 4.0.....	73
MetaCreations Painter 5	76

First Looks

The next thing to know is that if you still don't have an Internet connection, you'll want to get one right away. All articles in these encyclopedias have links to relevant Web sites; this is just one way the encyclopedias can stay current.

Also, you should take into consideration the reading level you need when choosing an encyclopedia. Britannica and Americana provide much more exhaustive treatment of general subjects than do Compton's, Grolier, Encarta, and World Book, and thus they are more appropriate than the others for doing detailed research. Collier's aims for this degree of detail and sometimes achieves it, but it won't overload the inquisitive younger explorer. The remaining products are best suited for high-school and undergraduate needs. Encarta and World Book go an extra lap this year to support this level of user, with new features that assist in term-paper preparation.

Our two Editors' Choices reflect the differences inherent in the target audiences for these encyclopedias. The visually compelling World Book earns high marks for the student, while the comprehensive content of Britannica CD 98 is a researcher's dream. Those looking for the most comprehensive and detailed treatment of broad topics should steer toward Collier's, Americana, or the forthcoming Britannica.

Bear in mind that a compelling presentation and dynamic user interface encourage casual exploration; this is a particularly important consideration with respect to younger users and students. You can think of these encyclopedias as research tools or as video games that you'll be happy to get caught playing. Either way, one of the products reviewed here will give you more than your money's worth of information and intellectual stimulation.

Encyclopaedia Britannica Inc. **Britannica CD 98 Multimedia Edition**



This year, the venerable Encyclopaedia Britannica has taken its first somewhat tentative steps into the fray of multimedia encyclopedias. Along with the largest and most authoritative store of information available in any encyclopedia, the Britannica CD 98 (\$125 list) now delivers 8,500 images (twice as many as last year), over 1,200 detailed maps, a smattering of videos and animations (but still no separate sound files), and

screen, each of which leads to features that are designed to help you make connections between different corners of the encyclopedic universe.

The Analyst draws on the most recent Britannica Yearbook data to allow statistical comparisons between 191 nations and regions. Filled with reports, tables, and graphs, the encyclopedia lets you compare data along seven dimensions: demographics, vital statistics, national economy, foreign trade, education and health, transport and communications, and the military.

Turn to Britannica's Timeline to see what was happening contemporaneously in the fields of architecture, litera-

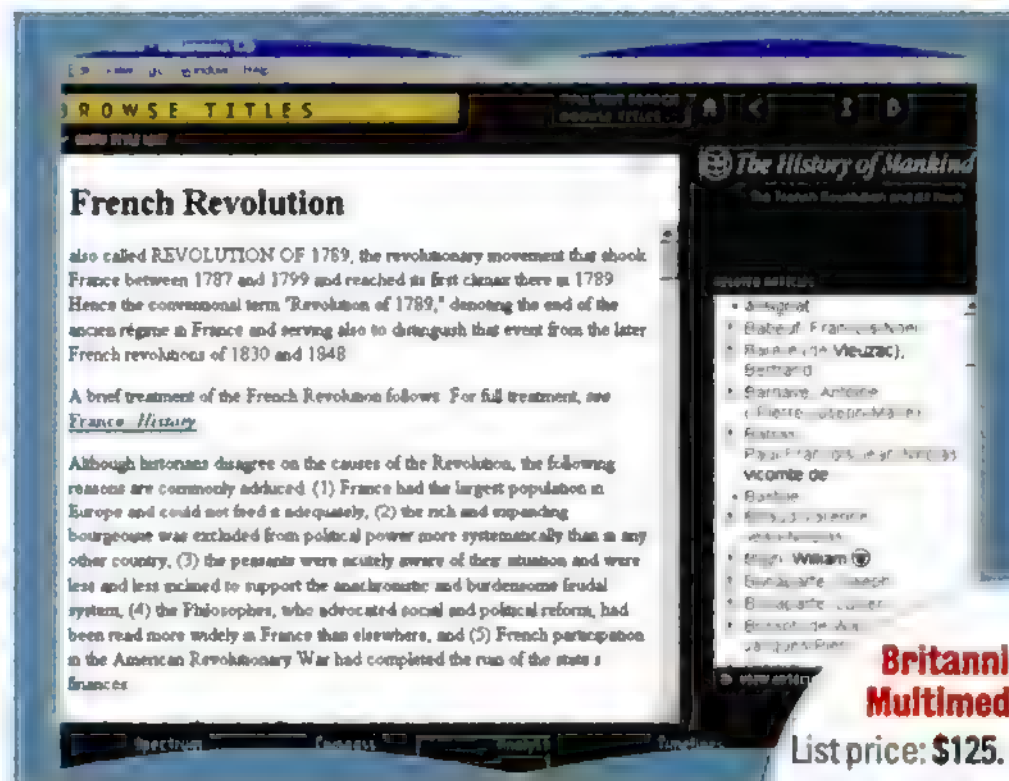
political views. They also reveal data regarding precipitation, vegetation, land use, population density, and language groups.

The Spotlights area gathers related material on six topics (à la collages in Encarta): the Olympics, ecosystems, human anatomy, dinosaurs, the American Civil War, and Britannica Classics. The last of these topics presents notable articles from earlier editions of the Britannica, including such gems from the 1926 edition as Freud's piece on psychoanalysis, Bertrand Russell's discussion of the philosophical consequences of relativity, and George Bernard Shaw's apologia of socialism.

Unlike the other encyclopedias discussed in this roundup, the Britannica does not update its article store on a monthly basis. Nevertheless, it does provide updated Web links each month, but these links have to be downloaded en masse (this is about a 15-minute process at 28.8 Kbps). Britannica Online, a companion product offered at \$50 per year (a three-month trial version is included with the

CD-ROM), does provide regular updates to the knowledge base, including a weekly review of current events. Britannica CD 98's brand new interface and integrating features help make the encyclopedia much friendlier

and more accessible, but it still remains less entertaining than either Encarta or World Book. Nonetheless, the product's principal strength continues to be its unparalleled wealth of information. Britannica's 44 million-plus words make it the biggest resource bargain available today for personal computers. If depth is what you need, then Britannica CD 98 is a terrific choice.



15,000 Internet links.

The Britannica now comes on three CDs—one to install the executables, the other two for delivering the goods—and features a completely redesigned user interface. Last year's text-oriented Netscape front end is replaced by a skillfully disguised and graphically oriented implementation of Microsoft Internet Explorer 3.02. You can browse through article titles, a powerful feature that complements Britannica's full-text search mode. Providing new and compelling ways to explore the encyclopedia is a bar of large buttons displayed across the bottom of the

ture, medicine, music, religion, science, technology, visual arts, and women's history. You select the areas you want to compare from two drop-down lists and drag a slider to any time period from 90,000 BC to the present. Britannica then depicts and describes significant events using images and relevant encyclopedia articles.

The Compass displays maps with corresponding article text. Buttons that are located just below the maps allow you to switch between physical and

Britannica CD 98 Multimedia Edition

List price: \$125. Requires: 16MB RAM, 45MB hard disk space, Microsoft Windows 95 or NT 4.0

Encyclopaedia Britannica Inc., Chicago, IL, 800-747-8503

www.eb.com

Circle 408 on reader service card.

Grolier Educational Corp. Encyclopedia Americana 1997 Edition

Densely packed with information, the Encyclopedia Americana 1997 Edition (which shipped too late to be included in our roundup earlier this year) is a research tool for the serious scholar. In fact, Americana is so geared toward those doing research that it is only sold to institutions, which accounts for the program's \$495 price tag.

From the outset, the Americana's decidedly prosaic face gives notice to the encyclopedia's serious and studious approach. Here you'll find no bird calls or national anthems to listen to, no Hindenburg disaster movies to watch, and no interactivities to interact with. In fact, the single CD's multimedia contributions consist entirely of tables, fact boxes, line art, flags, and maps. You can read 5,600 words about Leonardo da Vinci in the Americana, but you won't be able to find a reproduction of the Mona Lisa.

What you will find, though, is high-quality, well-written text. Along with the 25 million words of the program's printed counterpart, you also get the Merriam-Webster's Collegiate Dictionary (Tenth Edition), the Academic Press Dictionary of Science and Technology, and Helicon's Chronology of

Editors' Choice

- World Book 1998 Multimedia Encyclopedia
- Britannica CD 98 Multimedia Edition



Two products, two audiences. Our two Editors' Choice recipients each bring something valuable to the table. The IBM World Book 1998 Multimedia Encyclopedia Deluxe Edi-

tion is most appropriate for students. With a clean and easy-to-read interface, homework and report wizards for assisting students, bibliographies sorted by reading level, and a plethora of study questions accompanying the articles, the World Book (\$70 street) is the best choice for a more youthful audience that wants to be entertained while they learn.

Although not as flashy or packed with multimedia as some of the other packages in this roundup, the renowned pedigree of the authoritative Encyclopaedia Britannica makes an impact with Britannica CD 98 Multimedia Edition. Notable for the unbeatable depth and breadth of its content, Britannica is a veritable bargain at \$125 (list). Whether you are doing serious research on an arcane topic or you are casually investigating the most basic elements of life, you will be drawn into Britannica's compelling articles.

World History. The Science and Technology volume is considerably more than a dictionary; it includes brief essays on many scientific topics as well as standard technical reference material.

The encyclopedia's longer articles are accompanied by outlines and unannotated bibliographies, and many of them are amplified by an excellent supply of Internet sites. When you come across a Web link in an Americana article, you

must connect before you can find out where you are going. But once you arrive online, you will be pleased with the number of well-chosen sites, and the program's ample site descriptions will help you make the most effective use of your connect time.

The Americana's hefty price coupled with its lack of sound and video are its chief drawbacks. An Internet-based alternative to the CD-ROM is available, but subscriptions start at \$495. As it stands now, this is clearly a product aimed at large-budget institutions, not cost-conscious libraries or PC users.

an expanded version of Online Knowledge Explorer.

New for this year, the Online Knowledge Explorer appears as a button accompanying all but the smallest articles. Clicking here takes you to a Grolier Web site where you can read associated articles in the online versions of either Encyclopedia Americana or the New Book of Knowledge. So if a Grolier article piques your interest but leaves you thirsting for detail, you can grab the counterpart piece from Americana.

If the Grolier item overwhelms or perplexes you, you can step back for a more general view via the New Book of Knowledge. In short, you get three encyclopedias at three distinct reading levels for the price of the Grolier Deluxe and an Internet connection. You can't browse the Americana or the NBK online, but you can get to the specific parts you need to help you better understand the topic at hand.

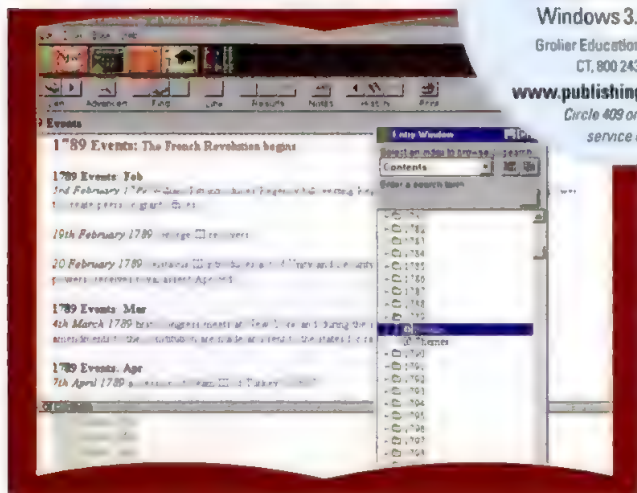
Grolier's own text base is comparable in scope to those of Encarta and World Book, which means that it provides introductory information at a level suitable for high schoolers and undergraduates. Articles are

Encyclopedia Americana 1997 Edition

List price (for libraries only): \$495. Requires: 4MB RAM, 4MB disk space, Microsoft Windows 3.1 or later

Grolier Educational, Danbury, CT, 800 243-7256

www.publishing.grolier.com
Circle 409 on reader service card



Grolier Interactive Inc. Grolier Multimedia Encyclopedia 1998

The Grolier Multimedia Encyclopedia 1998 comes in two flavors: a single-disk standard edition (\$40 street) and a two-disk deluxe edition (\$60 street). The best reason to buy the two-disk model—indeed, the best feature of the whole encyclopedia—is

First Looks

equipped with navigable outlines and unannotated bibliographies. Many of them also include links to the Grolier Internet Index, where you'll find annotated links to relevant Web sites (the index includes over 21,000 sites). Unfortunately, you cannot peruse the list en masse;

interactivities are nowhere near as interactive as the comparable items in Collier's, Encarta, or World Book.

Grolier also has a static, unwelcoming interface. Media and text el-

ements are nowhere near as interactive as the comparable items in Collier's, Encarta, or World Book. Grolier also has a static, unwelcoming interface. Media and text el-

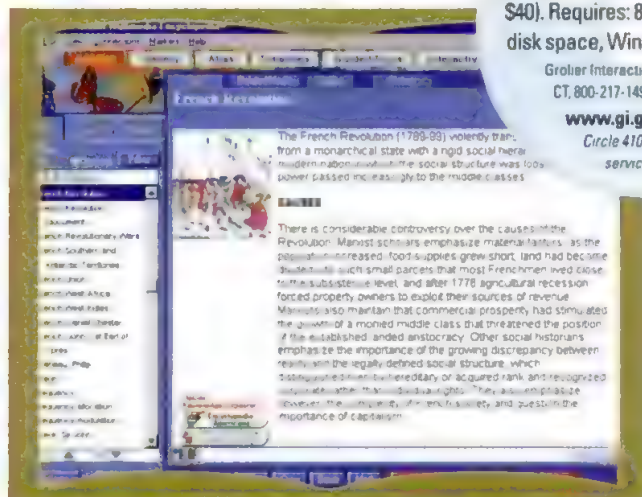
Grolier Multimedia Encyclopedia 1998

Street Price: \$60 (standard edition, \$40). Requires: 8MB RAM, 10MB disk space, Windows 3.1 or later

Grolier Interactive Inc., Danbury, CT, 800-217-1496, 203-797-3530

www.gi.grolier.com

Circle 410 on reader service card



instead, you see only the selections that Grolier deems relevant to the current article.

Other Grolier highlights include the complete American Heritage Dictionary (which is better than Encarta's abridged version of the same), 1,200 interactive maps, and 31 guided tours. Interactive city maps show you the highlights of potential travel destinations. For example, you can pass your mouse over the map of Vienna, click on the Burgtheater to see a picture of the building, or click on the Danube to read an article about the river. The guided tours gather together all of Grolier's words and media relating to such broad topics as Exploration and Discovery, the Fifties, and Food and Nutrition.

On the whole, media quality in Grolier is disappointing, despite the inclusion of some exciting historical sound clips (such as William Jennings Bryan's Free Silver speech). Some of the .WAV clips are distorted by ill-advised cuts and splices. The program's 116

elements appear in fixed frames and are often obscured by the need to click notebook-style tabs. Program controls are scattered across different regions of the screen in a manner that has no apparent purpose, and the entire presentation does little to encourage casual browsing.

Content issues aside, a new design would help make Grolier a more effective competitor.

IBM

World Book 1998 Multimedia Encyclopedia



Geared toward high school and undergraduate students, IBM's revamped World Book Multimedia Encyclopedia has the cleanest, most readable, and most navigable user interface of this year's lineup. World Book comes in two-

disk deluxe (\$70 street) and single-disk standard (\$40 street) variants and (in keeping with its pedagogical focus) is both teacher- and parent-friendly. The new interface includes a full-page main menu that distinguishes between browsing and searching functions. Large icons are arrayed across the top of encyclopedia pages. A guide pops up as your mouse glides over an icon, making it easy for even the youngest explorers to find their way through the encyclopedia. And a large-font black-on-ecru text presentation invites on-screen reading.

Long articles come with bibliographies that are broken out by reading level; you'll also find suggested study questions designed to help students get the most out of the information presented. Clicking on the "Webliner" button takes educators to a World Book Web site that offers research and curriculum support. The names of other relevant

Web sites appear as links alongside the article text when the user

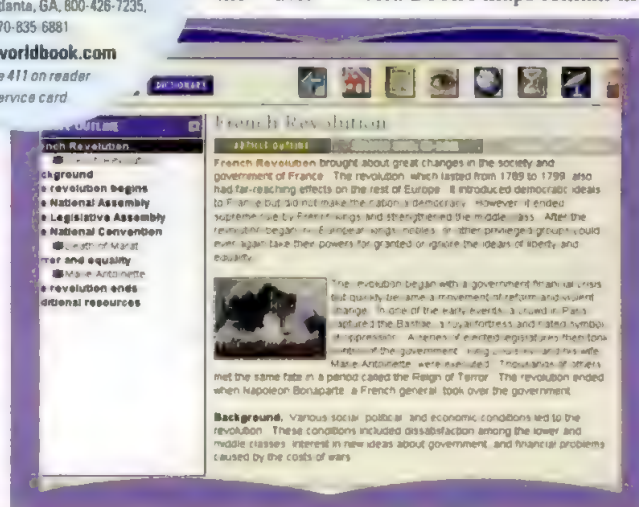
World Book 1998 Multimedia Encyclopedia

Street price: \$70 (standard edition, \$40). Requires: 16MB RAM, 25MB disk space, Windows 3.1 or later

IBM PC Co., Atlanta, GA, 800-426-7235, 770-835-6881

www.worldbook.com

Circle 411 on reader service card



clicks on the 'Related Info: Online' button.

A new set of Homework Wizards assists students in assembling World Book material into reports. The Report Wizard guides you through all phases of the reporting process, from selecting a topic and creating a schedule to outlining, writing, revising, and adding finishing touches. Additional wizards offer a rudimentary charting module and a time-line tool. The former allows users to build their own charts from encyclopedia data rather than merely copying over World Book charts, while the latter encourages users to discover for themselves which events are worthy of timelines.

World Book has a section called Our Century, which allows you to read articles from previous World Book editions (via the Web) dating back to the encyclopedia's 1992 debut. Enterprising investigators can get a sense of how the century's various traumas and triumphs appeared from chronologically close vantage points, just as if they were reading contemporaneous newspaper accounts. Meanwhile, current events of 1997 and 1998 are covered in This Month in Brief, a section that's automatically refreshed when you perform a monthly update in the Deluxe Edition.

Aside from one shortcoming, World Book's maps remain the

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You Want Fast, Award

... we give you the Micron™ TransPort™ XKE!



When you need more portable power, the Micron TransPort product team charges ahead with (clockwise from bottom left): Julia, Drew, Bill, Jeff, Jeff, Andrew and Kim.



-Winning Portables

Portable Solutions

The speediest portable line-up.

Imagine one of the world's fastest portable computers just got faster. That's what happened when Micron took the award-winning TransPort XKE 166MHz portable and gave it a big boost with Intel's 200MHz or 233MHz Pentium® processor. Now the XKE 166 has topped itself. And you'll notice the difference.

The first speech recognition portables!

Micron is the only place you'll find portables standard with a voice recognition system — included on all TransPort XKE models. Now you can create documents and look up words by talking to your computer. Just speak naturally and watch as sentences appear on your screen. And you can upgrade our TransPort VLX model to include voice recognition.

Incomparable features and performance.

You'll be in awe of the brilliant image on the TransPort's active-matrix screen display, enhanced by a high-performance graphics accelerator. Other great features include a swappable floppy drive and CD-ROM drive. You also have a choice of the Microsoft® Windows® 95 or Windows NT® Workstation operating system pre-installed.

Our TransPort team has a notebook for everyone. Call today and ask about our XKE model or the value-packed TransPort VLX starting at just \$2,249.

Call now to order.
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Configured For Your Life™



You Need A Feature-

... and the Micron™ Millennia® brings it all home.



Packed Performer

Performance Desktop Solutions

Introducing new and exciting features.

The Micron Millennia desktops tout the industry's highest awards for screaming performance and feature-packed configurations, making them the envy of our competitors.

Choose the Millennia XKU and you'll get an Intel Pentium® II processor with MMX™ technology. Not to mention an AGP-powered graphics for top-notch 3D performance, along with MPEG and 24X EIDE CD-ROM drive.

Your choice of incredible software packs!

Now when you buy a Micron Millennia, you can pick one of four software packs to be included with your system. Choose from the Quicken Financial Pak, the EdVenture Pak, Arcade Pak, or the Home Productivity Pak. Pay only \$69 for each additional pack you choose.

Included Zip drives.

The entire Millennia family comes standard with a 100MB Iomega Zip drive — giving you virtually unlimited storage! And you can easily transport files from home to work, saving and using multimedia files and applications. A Zip drive also gives you a built-in backup system for your computer.

Giving it a boost with Fusion 3D™.

Upgrade your Millennia system with Fusion 3D and you'll get a DVD drive, incredible 3D graphics, AWE 64 ISA sound card, a two-speaker satellite with a subwoofer, an exciting game bundle and a Microsoft® SideWinder joystick. You won't believe how your games and multimedia applications spring to life like never before!

How did the Millennia get so good? With the help of Micron's Consumer Products team left to right: Bob, Jon, Lori, Jeff, Tina, Christy, Rich, and Casey.

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You Ask For Serious

*... we introduce Micron™ NetFRAME® servers
and the ClientPro® MRE!*



Business Solutions

Business Solutions

*Our Server and ClientPro
Product groups mean
big business. They are
(clockwise from
bottom): Amber,
Jody, Tracey, Rex, Rob,
Amanda and Todd.*



The new Micron NetFRAME servers.

With the introduction of Micron NetFRAME servers, you'll get the latest server technology, custom-built for thousands less than you'd expect.

Building on a solid reputation.

NetFRAME Systems has designed enterprise-class servers since 1987, delivering an unprecedented ability for businesses to use their networks for maximum advantages. So when Micron acquired the company this year, we were ready to build on NetFRAME's reputation and proven experience.

The Micron NetFRAME MV5000 server gives you enterprise-level features at a mid-range price point, and you'll get the security and high availability of fault-tolerant components including hot-swappable and redundant hard drives and power supplies. Our Micron NetFRAME LV2000 server delivers integration and stability at a low price. And our Micron NetFRAME 9008 and 9016 series offer excellence in enterprise servers.

ClientPro — there to take the challenge.

Micron's dependable ClientPro systems are network-ready and can handle all your business computing tasks. ClientPro systems are built on a stable platform, and with Intel Pentium or Pentium II processors, they pack the power to run the latest technologies — so you'll have a reliable business PC that reduces the risk of downtime and lowers your total cost of ownership. The new ClientPro MRE includes all the latest management tools like DMI 2.0, LANDesk 3.1 and Wake On LAN adapters for enhanced remote management, and chassis intrusion alert for security protection.

Micron's server and client product teams always bring you complete networking solutions. And you'll get Micron's award-winning customer service, 24-hour technical support, and a limited warranty that's hard to beat.

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You Want A Workstation To Beat All Others

... we present the Powerdigm™ XSU with Micron-engineered technology!



Making it the workstation to beat are Powerdigm team members, left to right, Stephanie, Terry and John.

Micron innovation at its best.

Revolutionizing workstation performance, Micron introduces our exclusive Samurai™ chip set on the Powerdigm XSU workstation. A powerful, Intel processor-based workstation, the Powerdigm XSU will execute your most demanding business and technical tasks — and it's flexible enough to run the most popular PC programs.

Engineered and developed by Micron, the Samurai chip set is the first to offer a 64-bit PCI bus, in a system based on the Intel architecture. The Samurai chip set enables greater bandwidth for engineers, graphic designers and technical professionals who demand maximum throughput from their workstations and integrated peripherals.

Micron's workstation team makes sure your needs are covered. So the Powerdigm workstation supports dual monitors, dual Pentium II processors, multiple ultra-wide SCSI-3 hard drives and 10/100 network adapters. The Fire GL video cards offers no-compromise 3D performance and Jaz drives are standard on both the XSU and XU Powerdigm models.

It's also hard to beat the industry-leading Micron Power limited warranty and our award-winning customer service and support. Call today and find out more about the Powerdigm XSU and XU workstations.



Business Solutions

NetFRAME® LV2000

Intel 233MHz Pentium II processor
ECC Level 2 cache on processor
32MB ECC SDRAM
2GB Ultra-Wide SCSI-3 hard drive
Microsoft® Windows NT® Server 4.0 (10-user license)
Intel LANDesk® Server Manager 2.8
NOS Support (3 incident resolutions/1st year), 7x24

STANDARD FEATURES

Single or dual Intel Pentium® II processors
512KB integrated cache in SEC package
ECC SDRAM option (4 DIMM slots)
5 expansion slots: 4 PCI, 1 ISA
Integrated Adaptec PCI Ultra Wide SCSI-3 controller
Integrated Intel EtherExpress™ Pro 100 controller
12X SCSI-2 CD-ROM drive
10 drive bays: 4 external 5.25"/1 external 3.5"
2 internal 5.25"/3 internal 3.5"
Dedicated server technical support, 7x24
5-year/3-year Micron PowerSM limited warranty
1-year next-business-day on-site service***

\$3,499

Bus. Lease \$119/mo.

NetFRAME MV5000

Intel 300MHz Pentium II processor
ECC Level 2 cache on processor
64MB ECC SDRAM
4GB Ultra-Wide SCSI-3 hard drive
Microsoft Windows NT Server 4.0 (10-user license)
NOS Support (3 incident resolutions/1st year), 7x24

STANDARD FEATURES

Single or dual Intel Pentium II processors
512KB integrated cache in SEC package
Memory: ECC EDO or ECC SDRAM option
9 expansion slots: 6 PCI, 2 ISA, 1 shared ISA/PCI
Dual integrated Symbios Ultra-Wide SCSI-3 controller
Integrated Symbios Narrow SCSI controllers
Embedded RAID Upgrade option
120 ready via embedded Intel i960-RD
5 Internal, hot-pluggable, hard drive array bays (Upgradable to 10)
1 (one) 360 watt hot-pluggable power supply standard (Upgradable to 3 for added redundancy)
Rack Adapter Option
Intel LANDesk Server Manager 2.8
Dedicated server technical support, 7x24
5-year/3-year Micron Power limited warranty
1-year next-business-day on-site service***

\$6,199

Bus. Lease \$195/mo.

ClientPro® VXL

Intel 166MHz Pentium processor with MMX™ technology
32MB EDO RAM, support for SDRAM
1.2GB SMART EIDE hard drive
15" Micron 500Lx, .28dp (13.7" display)

512KB pipeline burst cache, flash BIOS, DMI 2.0
3Com 3C509 ISA Ethernet T-P NIC
16X EIDE variable speed CD-ROM drive
S3 ViRGE graphics accelerator, 2MB EDO RAM
Microsoft Mouse
Microsoft Windows® 95
5-year/3-year Micron Power limited warranty

\$1,399

Bus. Lease \$48/mo.

ClientPro MRE

Intel 200MHz Pentium processor with MMX technology
64MB SDRAM
2.1GB Ultra ATA SMART EIDE hard drive
15" Micron 500Lx, .28dp (13.7" display)

512KB pipeline burst cache, flash BIOS, DMI 2.0
Pro 100 with Wake On LAN Network Adapter
16X EIDE variable speed CD-ROM drive
S3 ViRGE graphics accelerator, 2MB EDO RAM
Intel LANDesk Client Manager
Advanced hardware monitoring and power management features
Chassis intrusion alert
Microsoft IntelliMouse
Microsoft Windows 95
5-year/3-year Micron Power limited warranty

\$1,699

Bus. Lease \$58/mo.

ClientPro XLU

Intel 266MHz Pentium II processor with MMX technology
64MB EDO RAM
2.1GB SMART EIDE hard drive
17" Micron 700FGx, .28dp (16" display)

512KB internal L2 secondary cache, DMI support
3Com PCI 10/100 ethernet NIC
16X EIDE variable speed CD-ROM drive
PCI 64-bit 3D video, MPEG, 4MB EDO RAM
Upgradable wavetable audio with speakers
Microsoft Intellimouse™
Microsoft Windows NT Workstation
Intel LANDesk Client Manager
5-year/3-year Micron Power limited warranty

\$2,499

Bus. Lease \$85/mo.

***On-site service for NetFRAME LV2000 and MV5000 server is provided by Digital Equipment Corporation and is optional.

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Portable Solutions

Micron TransPort™ VLX

166MHz Intel Pentium processor with MMX technology
16MB EDO RAM (40MB max.)
1.6GB hard drive
16X modular CD-ROM drive
Li-Ion battery
12.1" TFT SVGA, 800x600 display
256KB L2 pipeline burst cache
PCI bus with 128-bit graphics accelerator
MPEG compatible
Zoomed video-ready
Touchpad pointing device
Microphone and 16-bit stereo sound
2-way infrared port
Modular floppy drive
Microsoft Windows 95 and MS Plus!
5-year/1-year Micron limited warranty

\$2,249

Bus. Lease \$77/mo.

Extended VLX Notebook Service Options

2nd and 3rd year parts and labor; 3-business-day turnaround for 3 years*	\$269
2nd and 3rd year parts and labor; 7-business-day turnaround for 3 years*	\$209

Micron TransPort XKE

STANDARD FEATURES

512KB pipeline burst cache
128-bit, 2MB DRAM graphics
20X modular CD-ROM drive with AutoPlay™ technology
Pick-a-Point dual pointing devices
Microphone and 16-bit stereo sound
Integrated 33.6 Kbps modem (upgradeable to 56Kbps), full duplex, CardBus- and zoomed video
2 infrared ports, S-video, NTSC, game and USB ports
Management and Executive Travel software pak
2 modular expansion bays
Dragon System NaturallySpeaking Personal voice recognition software
Custom nylon carrying case
Microsoft Windows 95 and MS Plus!
Microsoft Office 97 Small Business Edition
5-year/3-year Micron Power limited warranty

Micron TransPort XKE 166

166MHz Mobile Intel Pentium processor with MMX technology
32MB EDO RAM
1.6GB removable hard drive
12.1" TFT SVGA display

\$3,899

Bus. Lease \$133/mo.

Micron TransPort XKE 200

200MHz Mobile Intel Pentium processor with MMX technology
48MB EDO RAM
3GB removable hard drive
13.3" TFT XGA display

\$4,899

Bus. Lease \$167/mo.

TransPort Options

Micron Executive™ desktop package: matching black 17" monitor (15.8" display), mouse, mousepad and keyboard (can be used with or without MicronDock. Available on XKE models only.)	\$599
Leather carrying case upgrade	\$99

Micron TransPort XKE 233

233MHz Mobile Intel Pentium processor with MMX technology
48MB EDO RAM
3GB removable hard drive
13.3" TFT XGA display

\$5,249

Bus. Lease \$165/mo.

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Configured For Your Life™

Performance Desktop Solutions

Millennia MME

STANDARD FEATURES

512KB pipeline burst cache, flash BIOS
Integrated 100MB Iomega Zip drive, 3.5" floppy drive
24X variable speed EIDE CD-ROM drive
32 voice wavetable stereo sound with speakers
USR Sportster 56K x2 data/fax modem*
PCI 64-bit 3D video, MPEG, 4MB EDO DRAM
Microsoft® IntelliMouse™, USB connections
Microsoft Windows® 95 and MS® Plus!
Microsoft Office 97 Small Business Edition
Choice of Micron Software Solutions Pak
5-year/3 year Micron Power™ limited warranty

Millennia MME 166

Intel 166MHz Pentium® processor with MMX™ technology
32MB SDRAM
3.2GB Ultra ATA hard drive
15" Micron 500FGx, .28dp
(13.7" display)

\$1,599

Bus. Lease \$55/mo.

Millennia MME 200

Intel 200MHz Pentium processor with MMX technology
64MB SDRAM
4GB Ultra ATA hard drive
17" Micron 700FGx, .26dp
(16" display)

\$2,099

Bus. Lease \$72/mo.

Millennia MME 233

Intel 233MHz Pentium processor with MMX technology
64MB SDRAM
6.4GB Ultra ATA hard drive
17" Micron 700FGx, .26dp
(16" display)

\$2,299

Bus. Lease \$79/mo.

Micron Software Solutions Paks

Quicken Financial Pak: Quicken Deluxe, Family Lawyer, Parent's Guide to Money, Financial Planner†

EdVenture Pak: Comprised of exciting children's educational and entertainment titles. Call for current list of titles.†

Home Productivity Pak: Creative Multimedia's Family Doctor, Comptons Interactive Encyclopedia, Mindscape's Mavis Beacon Teaches Typing, Broderbund's PrintShop Ensemble III, Net Nanny, Crayola's Magic 3D Coloring Book†

Arcade Pak: X-wing vs. Tie Fighter, Need 4 Speed 2, Command and Conquer Red Alert, Thrustmaster Game Pad†

Millennia XKU

STANDARD FEATURES

82440LX chip set
512KB internal L2 cache, 2MB BIOS
Integrated 100MB Iomega Zip drive, 3.5" floppy drive
24X EIDE variable speed CD-ROM drive
32 voice wavetable stereo sound with Advent 009 speakers with subwoofer
USR Sportster 56K x2 data/fax modem*
Diamond Viper V330 128-bit 3D video with 4MB SGRAM
Microsoft IntelliMouse, USB connections
Microsoft Windows 95 and MS Plus!
Microsoft Office 97 Small Business Edition
Choice of Micron Software Solutions Pak
5-year/3 year Micron Power limited warranty

Millennia XKU 266

Intel 266MHz Pentium II processor
(features MMX technology)
64MB SDRAM
6.4GB Ultra ATA hard drive
17" Micron 700FGx, .26dp
(16" display)

\$2,599

Bus. Lease \$89/mo.

Millennia XKU 300

Intel 300MHz Pentium II processor
(features MMX technology)
128MB SDRAM
8.4GB Ultra ATA hard drive
17" Micron 700FGx, .26dp
(16" display)

\$3,099

Bus. Lease \$106/mo.

Fusion 3D Option Pak

DVD-ROM, **DVD software
E4 Cool DVD PCI decoder card: 6 channel AC-3 to 2 channel out capability, SPDIF output (digital audio out)
AWE 64 ISA sound card
Cambridge SoundWorks/MicroWorks - 2 speaker satellite with subwoofer stereo system
Monster 3D graphics card with 4MB memory***
Fusion 3D game pak: Mech Warrior 2: Mercenaries D3D version, AH-64D Longbow, U.S. Navy Fighters '97, Command & Conquer, Formula 1 D3D Edition
MS Sidewinder™ Pro Joystick

**MME add \$699
XKU add \$549**

*Maximum transmission speed of up to 56Kbps when downloading data and 33.6Kbps when uploading. However, actual performance is dependent upon numerous factors and observed transfer rates may be less than the maximum potentials.

**The CD ROM drive will be removed upon the purchase of the DVD upgrade

***Available only on Millennia MME system



Workstation Solutions

Powerdigm™

STANDARD FEATURES

12/20X variable speed SCSI CD-ROM drive
4GB Ultra-Wide SCSI-3 hard drive
Supports multiple IDE Ultra ATA and Ultra-Wide SCSI-3 hard drives
DMI, software and hardware management support
Iomega Jaz SCSI drive with 1GB removable cartridge
Wavetable stereo sound with speakers
Fast Ethernet 10/100 PCI network adapter
Microsoft IntelliMouse
Microsoft Windows NT Workstation
19" Hitachi SuperScan CM751 (18" display) .26dp monitor
Optional support for dual monitors
5-year/3 year Micron Power limited warranty

Powerdigm XLI

Dual Intel 200MHz Pentium II processor
64MB ECC EDO RAM
Memory upgradable to 512MB ECC EDO RAM
Number Nine Revolution 3D
video card, 4MB VRAM

\$4,899

Bus. Lease \$167/mo.

Powerdigm XSL

Samurai™ chip set
Dual Intel 300MHz Pentium II processors
64MB ECC SDRAM
Memory upgradable to 1GB ECC SDRAM
Fire GL 1000 pro 8MB 66MHz PCI
Open GL Professional
3D accelerators

\$6,199

Bus. Lease \$195/mo.



Call our sales team
today! Left to right:
Felice, Brian, Fred,
Justin, Bruce
and Ron.

MICRON POWER™ WARRANTY

5-year limited warranty on microprocessor and main memory
3-year limited parts-only warranty (1-year for Transport Vult)
1-, 2- or 3-year optional on-site service agreement for Micron desktop and server systems
30 days of free Micron-supplied software support for Micron desktop systems; 3 optional
network operating system incident resolutions included for Micron server systems
30-day money back policy
24-hour technical support
The foregoing is subject to and qualified by Micron's standard limited warranties and terms
and conditions of sale. Terms and conditions of sale may vary for specific configurations.
Copies of the limited warranties may be obtained on our Web site or by calling Micron.

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A Day, 7 Days A Week
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Toll free from Canada: 800-708-1758
Toll free from Puerto Rico: 800-708-1756
International Sales: 208-893-8970
International Fax: 208-893-7393

Other Systems Options

Multimedia Options

32 voice wavetable stereo sound card ¹	\$59
32 voice wavetable stereo sound card with 2MB RAM ¹	\$99
Advent AV270 Powered Partners stereo speakers	\$79
Advent AV370 Powered Partners stereo speakers with subwoofer	\$199
Microsoft SideWinder™ 3D Pro joystick	\$59
Microsoft SideWinder gamepad	\$39

Storage/Media Options

Adaptec 2940U Ultra SCSI Fast-20 controller	\$100
(upgrade from systems with standard Ultra SCSI Fast-20 controller)	
Plexor 12/20 Plex 3MB/sec SCSI internal CD-ROM drive ¹	\$100
(upgrade from systems with standard EIDE CD-ROM drive)	
Iomega Jaz SCSI drive with 1GB removable cartridge ¹	\$299
Iomega Zip IDE drive with 100MB removable cartridge	\$99
Iomega 6-pack of 100MB Zip cartridges	\$99
Sony 4/8GB SCSI DDS-2 tape backup drive with tape and software ¹	\$899
Cheyenne ARCserver with Inoculan	\$499

Display/Video Options

17" Hitachi SuperScan CM630 (15.9" display) .26dp color monitor ¹	\$100
19" Hitachi SuperScan CM751 (18" display) .26dp color monitor ¹	\$300
21" Hitachi SuperScan CM801 (20.0" display) .26dp color monitor ¹	\$650
Number Nine Imagine 128 series II video card, 4MB VRAM	\$299
Number Nine Imagine 128 series II video card, 8MB VRAM	\$549

Printer Options

HP DeskJet 692C	\$269
HP DeskJet 890Cai	\$429
HP LaserJet 6Lai	\$399
Lexmark 2030 Color Jetprinter	\$179
Lexmark 7200 Color Jetprinter	\$399
Lexmark Optra E+ Laser printer	\$399
Epson Stylus Color 600	\$269
Epson Stylus Color 800	\$399
Canon BJC - 80	\$299
Canon BJC - 250	\$149
Canon BJC - 4300	\$199
10ft. IEEE-1284 Printer Cable	\$ 16

Communication Options

33.6 external data/fax modem	\$299
56Kbps technology modem ¹ upgrade	\$99

Server Extended Service Options

2nd and 3rd year next-business-day ¹ on-site service coverage ¹	\$99
4-hour response ¹ on-site service coverage ¹ (8am - 5pm, M-F), 3 year	\$798
4-hour response ¹ on-site service coverage ¹ (24 hours, 7 days per week), 3 year	\$998
Other service options may be available, ask your system consultant	

Extended Desktop Service Options

Optional 1st year on-site service ¹ coverage included	
2nd year on-site service ¹ coverage	\$79
2nd and 3rd year on-site service ¹ coverage	\$99
Other service options may be available, ask your system consultant	

Software Options

Small Business Essentials: QuickBooks, Visio, Norton AntiVirus, Astound, Focal Point, American Yellow Pages	\$179
CorelDRAW 7 (full retail version)	\$299
Corel WebMaster Suite (full retail version)	\$99

Network Options

3Com 3C509B Etherlink III ISA combo network adapter	\$79
3Com 3C905 EtherlinkXL PCI combo network adapter	\$99
3Com OfficeConnect Hub 8/TCP	\$149
3Com OfficeConnect Switch 140	\$969

Other Options

APC Per/TT surge suppressor	\$39
APC Pro/TT surge suppressor	\$59
Microsoft Natural Keyboard (upgrade from standard keyboard)	\$49

¹ Requires SCSI host adapter
² Upgrade from systems with standard Micron 17" 179Kx color monitor
³ 1st year on-site service is available in the United States and in limited
areas in Canada from third-party service provider per customer's
agreement with provider
⁴ 2nd year and 3rd and 4th year offerings are available in the
United States only. Extended services, if purchased after system
shipment may have a higher cost.
⁵ Service will be scheduled whenever possible, for the next business
day after parts are received by the customer
⁶ Available on certain locations, ask your system consultant for details.
Some options and accessories available with system purchase only

* Maximum transmission speed of up to 56Kbps when downloading data and 33.6Kbps when uploading. However, actual
performance is dependent upon numerous factors and observed transfer rates may be less than the maximum potentials.

Available only on Millennium systems with Microsoft Windows 95

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Configured For Your Life™

First Looks

model that other encyclopedias should strive to emulate. Convenient overlay buttons transform political maps into informative demographic or climate maps.

This year's World Book introduces nearly 100 "bubble views"—3D virtual-reality tours of important buildings and other objects of interest. Though they lack the sound and still-photo connections provided by Encarta's "virtual tours," they surpass their Encarta counterparts by allowing users to look up and down as well as all around. With

the bubble views, you can inspect the paintings on the walls of the Capitol rotunda and even take a flat-on-your-back look at the dome.

The depth of the World Book is similar to that found in Encarta and Grolier, slightly more than Compton's, and well below Collier's, Americana, and Britannica. But if this level meets your needs, go with World Book.

The Learning Co. Inc. Compton's Interactive Encyclopedia 1998

As with a number of encyclopedias in this roundup, Compton's Interactive Encyclopedia 1998 comes in two versions: a two-disk Deluxe Edition (\$65 street) and a single-disk standard edition (\$45 street). The deluxe model adds enough new multimedia elements to bring the encyclopedia into rough media parity with Encarta, Grolier, and World Book.

The articles remain somewhat lighter and shorter than those found in competing encyclopedias, and some topics that get article treatment in other products are relegated to glossary-style pop-ups in Compton's. Major articles come with unannotated bibliographies attached; nevertheless, most longer pieces also

link to valuable Web resources.

Along with 6,600 direct Web links, the encyclopedia features a well-annotated directory of 4,000 Web sites organized by topics and subtopics to help you quickly locate what you need. Each Web site's description includes an assessment of its target age range, allowing parents and teachers to help steer users away from inappropriate destinations. An item in the program's Preferences dialog box lets you disable Compton's Internet menu altogether, but this does not remove the direct links in the text.

The Deluxe Edition also includes a useful Ask the Librarian

pointer changes from arrow to book; click once and an article on Switzerland appears.

Each version has a 78,000-definition dictionary as well as a 21,500-entry thesaurus. (Compton's is the only encyclopedia equipped with a thesaurus.) If you double-click on an unfamiliar word in the text of an article, you'll instantly see its definition. Both versions also offer ShowMaker, which lets you assemble articles and media elements into a slide show complete with your own (optional) voice narration.

Compton's Planetarium tells you which objects are visible in the heavens at any time, place, and viewing angle (places may be specified as city names or as latitude/longitude coordi-

Microsoft Corp.

Microsoft Encarta 98 Encyclopedia

Microsoft Encarta 98 Encyclopedia Deluxe Edition bends over backward to make encyclopedia exploration fun and rewarding. More than any other vendor, Microsoft has found ingenious ways to integrate textual information with photos, movies, animations, and sound—almost to the point where the encyclopedia is as much an entertainment product as it is a reference tool. Some users may prefer the World Book's relatively clean and quiet presentation to the Encarta's in-your-face-and-ears razzle-dazzle, but Encarta is undeniably alluring and captivating.

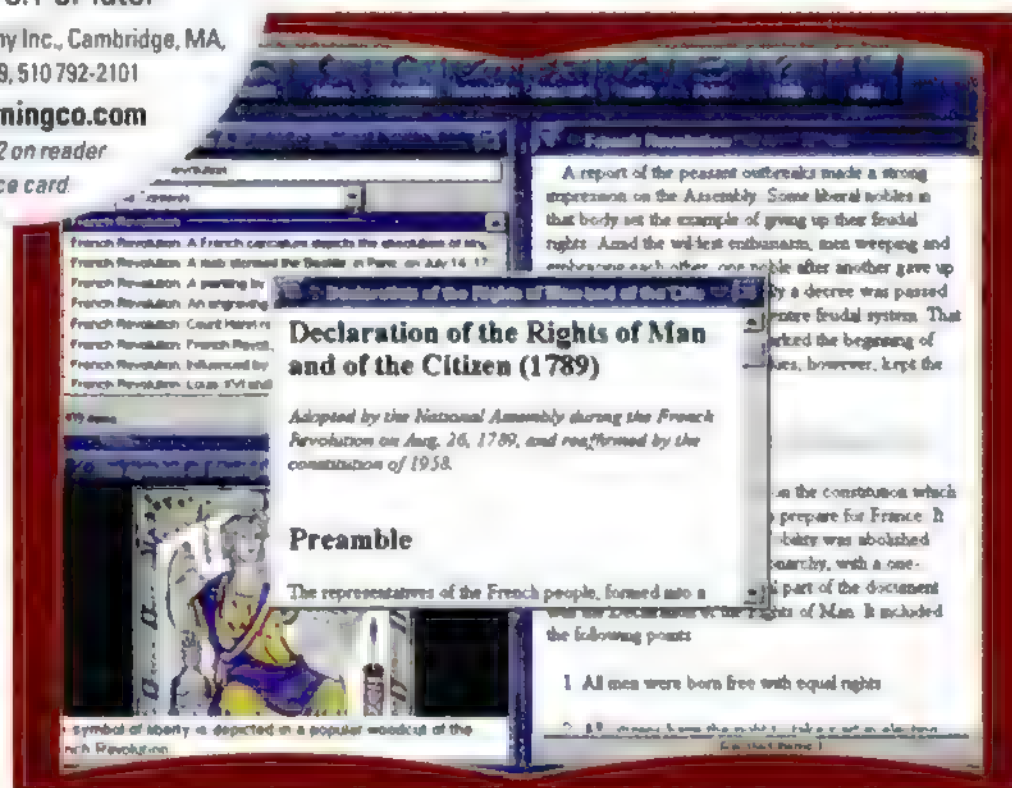
There are two versions of Encarta 98: the three-disk Deluxe Edition (\$80 street) and the two-disk non-Deluxe edition (\$55 street). The Deluxe Edition's third disk is devoted entirely to the Research Organizer, a new feature that guides you through the process of creating notecards and reports. Though useful and conveniently integrated with Encarta, the Research Organizer provides less support for the budding term-paper writer than what's found in the Homework wizards that IBM has added to this year's World Book.

The Deluxe Edition also offers 2,000 more articles and a great deal more media than the non-Deluxe edition. In addition, you get 18 months of free online updates from July 1997. (If the non-Deluxe edition is preinstalled on your new PC, you can buy an update subscription for \$19.95.)

Encarta's article text is solid, but it is certainly not exhaustive; compared with the other packages in this roundup, Encarta would fall into a position comparable to that of Grolier and World Book. But undergraduates and high school students should find it adequate.

This year's version complements its knowledge base with 900 sidebars, which present

**Compton's
Interactive
Encyclopedia 1998**
Street price: \$65 (standard edition, \$45). Requires: 8MB RAM, 12MB disk space, Microsoft Windows 3.1 or later
The Learning Company Inc., Cambridge, MA,
800-227-5609, 510 792-2101
www.learningco.com
Circle 412 on reader service card



an command. You can pose research problems on the program's Web site and receive e-mailed suggestions within two business days. We tried it and were rewarded with two Web sites and the names of two books that helped flesh out a research project. Unfortunately, the e-mail also referred us to a Compton's article that did not exist.

This year's maps also provide more political detail, but they still lack the demographic and climate information afforded by World Book. As in previous editions, maps are linked to associated text. Hover the mouse over Switzerland, for example, and the

pointer changes from arrow to book; click once and an article on Switzerland appears.

Neither Compton's ShowMaker nor Planetarium has a counterpart in the other products; that should make Compton's an attractive choice for particular users. Evaluated as a general-purpose research tool for high school and undergraduate students, however, Compton's comes up a pace short of Grolier, Encarta, and World Book.

10

Listen to the recording and complete the notes below.

The object is to get the best of the Internet, not let the Internet get the best of you.

The *Pathfinder.com* Web site is one of the best places on the Internet to find valuable information. But if you want to get it as fast and as easily as possible, you'll need the right tool – like a U.S. Robotics® 56K¹ modem with x2™ technology.

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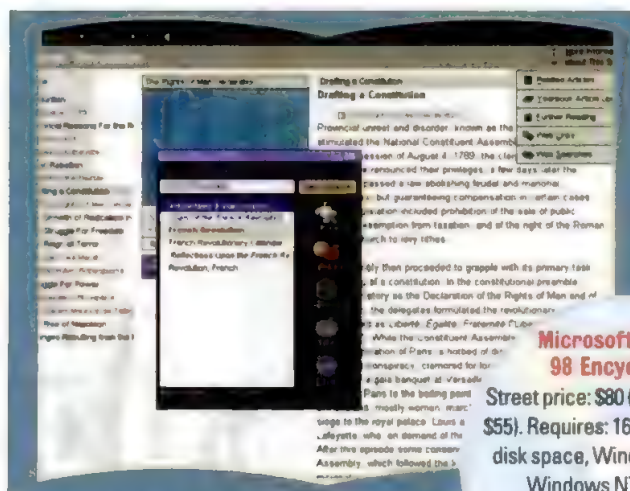


First Looks

source documents and contemporaneous accounts of historical events. Encarta 98 also adds 19 new "virtual tours" that use panoramic virtual-reality technology to take you in and around celebrated buildings and other points of interest. You can use them to explore nearly every angle of Montmartre, and while wandering through Montmartre you can enlarge a still photo of the Basilica Sacre Coeur or listen to Edith Piaf sing "La Vie en Rose." World Book's bubble views are more numerous than Encarta's virtual tours, but the latter are more cleverly linked with related media.

Encarta also ups the number of interactivities to 24. These cover everything from ecological matters and natural wonders to anatomy, physics, art, music, and finance. Oddly enough, though, they are not linked to relevant encyclopedia articles.

On our tests, we encountered two problems with Encarta. First, black-and-white images copied on a high-color display appeared in ugly shades of lavender when pasted into Microsoft Paint, Microsoft Word, and other client applications. Because most of the photos associated with historical articles are in black and white, this is an irritating problem. Second, the program crashed when we exited the virtual tours. Microsoft says it's looking into each matter and that the second prob-



Microsoft Encarta 98 Encyclopedia

Street price: \$80 (standard edition \$55). Requires: 16MB RAM, 40MB disk space, Windows 95 or later, Windows NT 4.0 or later
Microsoft Corp., Redmond, WA, 800-426-9400, 425-882-8080
www.encarta.msn.com
Circle 413 on reader service card

lem may be the fault of a bug in the Macromedia Flash 2.0 driver used by the virtual tours.

Encarta remains the most entertainingly browsable encyclopedia in the current roundup. If you're looking to hook a youngster on reference reading with a dash of entertainment, this is the one for you.

Sierra On-Line Collier's Encyclopedia 1998

Collier's Encyclopedia 1998 (\$80 street) is the first independently sold paperless version of the Collier's Encyclopedia as well as the first with multimedia. Sierra On-Line's version includes Collier's engaging set of interactive simula-

tions, rich assortment of media elements, and sheer volume of text.

At 17 million words, Collier's is less comprehensive than Americana and Britannica. Nonetheless, it occupies a useful niche between the two heavy hitters and the rest of the pack. Thanks to its richly detailed articles, Collier's holds excellent appeal for high school and college students who want more information on broad topics than they'll find in, say, Encarta or World Book. Where appropriate, Collier's augments its own information storehouse with annotated links to well-chosen related

Web sites. But the encyclopedia's own articles

do not have bibliographies—a glaring omission in a product that leads with its text.

Collier's still photos come in multiple resolutions, allowing you to zoom in for close inspection of faces, buildings, and other details. There are numerous videos to be found on the disk, but they're almost always disappointingly short. Elsewhere on the media front, the program offers an appealing set of what it calls "simulations" (interactivities would be a more

accurate description). Within the realm of these simulations, you can try your hand in the chemistry lab, play a challenging geography game, test different musical instruments, and so on. A trivia game will send the avid investigator all over the encyclopedia in search of some remarkable and surprising facts.

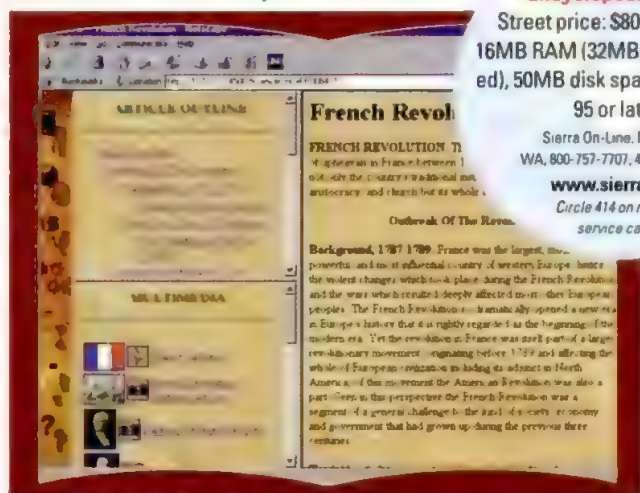
Collier's uses Netscape Navigator 4.0 (which is included) as its front-end. The program's own user interface is confined to a frame along the left edge of the browser's screen. Everything else

you see looks and behaves exactly like the familiar Netscape interface.

This unusual design allows for seamless integration between encyclopedia articles and Web sites. But it also makes for uncommonly sluggish response times when accessing data. Movement from article to media item often entails delay, because you have to wait while Netscape loads a plug-in. And unlike the other programs, in which a search dialog is always instantly accessible, Collier's makes you reload its locally-stored home page every time you want to re-search a new topic.

We were concerned with the disturbing number of reliability problems we experienced while exploring the encyclopedia. Certain media links produced unrepeatable lockups. The program's AutoUpdate feature did not work, and a prominently displayed link to the Collier Newfield Web site took us instead to www.newfield.com, the home page for Star Trek Universe cards. At one point, the program crashed repeatedly until we reinstalled it.

With these glitches in mind, we'd have to rate Collier's as promising but not yet ready for prime time. **PC**



Collier's Encyclopedia 1998

Street price: \$80. Requires: 16MB RAM (32MB recommended), 50MB disk space, Windows 95 or later
Sierra On-Line, Bellevue, WA, 800-757-7707, 425-649-9800
www.sierra.com
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First Looks

HTML EDITING

Great Sites by Design

Microsoft's FrontPage 98 is currently the most powerful and flexible Web site builder out there.

By Edward Mendelson

In a matter of minutes, Microsoft's FrontPage 98 (\$149 list) will let you create a complex interactive Web site that looks and acts as if you had spent weeks at the drawing board. The program gives you the ability to design it all: from dazzling graphics and animated ad banners to elaborate navigation tools, site-search forms, discussion-group pages, and databases.

Microsoft FrontPage's word processor-style HTML (HyperText Markup Language) editor supports every cutting-edge tool from frames to Java applets through Dynamic HTML and Cascading Style Sheets. Tightly integrated with the editor is a Windows Explorer-style site manager that can apply a consistent graphic design to all pages, verify local and remote links, automatically build navigation bars, and upload the site to your Web server.

CREATING THE PAGE

Every stage of page creation and site management is blissfully easy. You blueprint a site by creating a tree diagram in the FrontPage Explorer site manager. Even after you post your site on the Web, all pages can be renamed or reorganized at any time by dragging page icons around the site map.

A toolbar lets you switch to views that list all files in the site, verify hyperlinks, and apply 1 of 50 supplied graphic "themes" with well-designed layouts, backgrounds, buttons, and banners. A utility applied to the package lets users create custom themes with their own graphics files and layout preferences.

The superb page editor uses

tabbed views for nearly WYSIWYG editing, HTML source-code editing, and an uneditable preview. When you create or edit a frameset, two additional tabs display both the frame layout and the page as it appears in browsers that do not support frames.

ADDING THE GRAPHICS

Graphics that you drag from your disk or import directly from your scanner are automatically saved in the same folder as your pages, and images in formats that browsers don't handle are automatically converted to GIF or JPEG formats. Built-in tools resize images, wash them out, convert them into "hover buttons," and create thumbnails that are automatically linked to full-size images.

All standard word-processing formats are converted transparently to well-formatted HTML pages. Tables can be built with a dialog box or drawn directly on a page with the mouse. When

essary HTML code. Such convenience is not found in other HTML editors.

IE, JAVA HOOKS

The preview window uses the page-displaying component of Microsoft Internet Explorer, so you can test almost every feature of your site without open-

most impossible to make them work in sites that use frames. But you are able to customize the look of the bars and apply them to one or more pages instead of the entire site.

ON THE SERVER SIDE

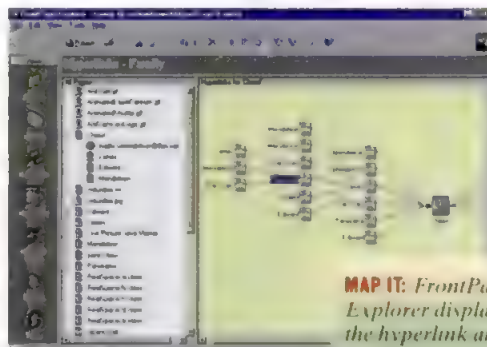
FrontPage is still the only program of its kind with built-in server-side scripting. A few mouse clicks are all you need to create forms that search your site, message boards, and hit-counters. These features will normally make you write or find complex CGI scripts.

This version of FrontPage includes features that save form input to text files, e-mail, or

databases, but these and all other server-side features will work only if you run your own server or if your Web-hosting service is one of the few hundred with FrontPage's server extensions. You may become confused by FrontPage's readiness to add server-side features to your pages without first asking you whether these features will be usable when posted to your Web site.

Many Web masters avoided earlier FrontPage versions because their automated features didn't work if you added or removed pages from Microsoft's precooked designs. The new version ranks as the most powerful and adaptable HTML editor and site manager on the market, making many other Web-building tools seem clumsy and inflexible by comparison.

Microsoft FrontPage 98. List price: \$150 (\$54.95 upgrade, \$40 rebate for Office users). Requires: 16MB RAM with Windows 95 or 32MB RAM with Windows NT 4.0, 36MB disk space. Microsoft Corp., Redmond, WA; 800-426-9400, 425-882-8080; www.microsoft.com/frontpage. Circle 407 on reader service card.



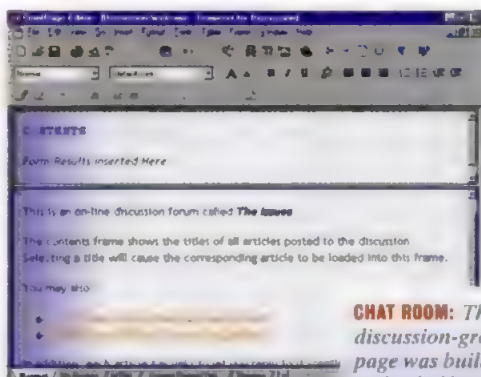
MAP IT: FrontPage Explorer displays the hyperlink and navigation structure of a Web site.

ing a browser. Well-

designed dialog boxes and wizards make it easy for advanced users to add Java, JavaScript, VBscript, ActiveX, Cascading Style Sheets, database access, and Microsoft's server-side push component (called "channels") to their pages.

Unfortunately, many features supported by FrontPage and Internet Explorer won't appear in Netscape Navigator. The most notable of these are ticker-tape-style marquees, colored table borders, and ActiveX controls.

The program optionally inserts one or more text- or graphics-based navigation bars on the top, to the left, or to the right of your pages. It then automatically rebuilds them when you rearrange your site. These bars can't add links to arbitrarily specified pages on or off your site, and it is al-



CHAT ROOM: This discussion-group page was built with a half a dozen mouse clicks, but it needs FrontPage's extensions installed on your server in order for it to work.

you insert a group of radio buttons into a form, FrontPage knows that you want only one of them to be selected at a time, and it automatically generates the nec-

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First Looks

HOME PCs

Hot Home Desktops

Pentium II home PCs from Compaq and Sony are geared for entertainment and communications.

By Bruce Brown

Although much of the news about family PCs this season focuses on sub-\$1,000 units, new high-end home systems combine powerful Pentium II CPUs and fast and capacious computing components with the newest entertainment and communications features. You can expect to pay between \$3,000 and \$4,000 for a top home system with a 17-inch monitor, but the latest entries from leading manufacturers enable family members to do more and do it faster than ever.

Compaq's top-level Presario 4850 (\$3,000 street, without monitor) and Sony's PCV-220 (\$2,700 street, also without monitor) were not available in time for our Home PCs feature story (see "Right At Home," in this issue), but they made it here for testing and evaluation before the issue closed.

The Presario 4850 and Sony PCV-220 give up no ground in traditional performance testing (see the benchmark table). With their added 3-D audio and augmented entertainment features (including a DVD-ROM drive in the Presario and a television tuner in the Sony), both systems can double as desktop media centers. Modems with digital answering machines let each system serve as the base for home telephony. Neither system

includes a camera for videoconferencing, but both have USB ports for multiple future additions, including digital video capture cameras.

COMPAQ PRESARIO 4850

The top Compaq Presario leads the home PC field in features, performance, and bang for the buck. Two of the Presario 4850's features are immediate standouts: the second-generation DVD-ROM player with ground-breaking software DVD MPEG-2 decoder and the smoke-gray tower case. The Presario 4850 has the expansion space to serve for the two or three years until high-end home-system buyers will inevitably want to upgrade.

The Presario 4850's components include a 300-MHz Pentium II CPU with a 440LX chip set, 48MB SDRAM (with a maximum of 384MB), a 6.4GB hard disk, and an ATI AGP 3D Rage Pro graphics card with 4MB of SGRAM. A K56flex modem is also included for the system's digital message center and full-duplex speakerphone.

The Presario's \$3,000 street price doesn't include a monitor, but the \$700 Presario 1725S 17-

inch monitor is a good match. This 0.28-mm dot-pitch unit can handle resolutions up to 1,280-by-1,024, plus it has attachable JBL Pro speakers and an integrated microphone.

FRIEND OF THE FAMILY

Ease of use is a big factor with the whole Presario line, and the 4850 serves well as the flagship. The top front of the case has lighted Easy Access buttons for launching applications, dialing the Internet, managing telephone messages and the speak-

fold-out hardware setup guide as well as extensive online documentation.

DVD-ROM

The Compaq Presario's second-generation 2X DVD drive was successful in playing the included Warner Music Video Sampler, a commercial DVD film, audio CDs, and audio CDs with multimedia tracks. First-generation DVD-ROM drives were not able to read CD-R disks, but the Compaq handled that task without a problem.

When watching a movie on a commercial DVD-ROM disk, our most discerning viewers were able to detect a bit of jumpiness in slow motion and long pan shots, but most didn't notice or weren't bothered by the minimal jumpiness. Software DVD decoding (see the sidebar "Software DVD: A Good Choice?") isn't quite as good as hardware decoding, but for many people it



SOFT-DVD: The flagship Compaq Presario 4850 breaks new ground with its software DVD decoder.

erphone, and controlling CDs. The Presario also includes Compaq Video Phone software for viewing video calls. A smoked-plastic door swings open to access the floppy disk drive and multimedia input jacks.

The Presario comes with a QuickRestore CD that will re-install and configure all of the software originally installed on the unit's hard disk. The illustrated Computer Setup and User's Guide comes with a

will be close enough (especially in a PC costing \$3,000).

The Presario 4850 also features Compaq's Creativity Imaging Center, which combines three front-mounted connectors for video and stereo audio input. You can connect VCRs and camcorders via these jacks for still-image and video captures with the included iPhoto Express, ColorDesk Photo, and Intel Video Capture utilities. Other bundled software titles in-

BENCHMARK TESTS



Home PCs

	ZD Business Winstone 98 Score	ZD Business Graphics WinMark 98 Score	ZD Business Disk WinMark 98 Thousands of bytes/sec	ZD CPUmark ₃₂ Score	ZD CD-ROM WinMark 98 Thousands of bytes/sec
Compaq Presario 4850 (PII/300, 48MB RAM)	19.5	107	886	772	968
Sony PCV-220 (PII/266, 32MB RAM)	18.1	100	1,270	681	1,150
Dell Dimension XPS (PII/300, 64MB RAM)*	21.3†	91†	1,370	742	1,510
Toshiba Infinia 7260 (PII/266, 64MB RAM)*	20.8	109	1,200	687	1,490
	BETTER ►	BETTER ►	BETTER ►	BETTER ►	BETTER ►

* Reported for comparison, both are Editors' Choices in this issue's home PC roundup, "Right At Home."

† We tested this unit at 32-bit color depth, all others at 24-bit color depth.



TUNE IN: The Sony PCV-220's TV tuner (left) offers image quality to rival your home set.

clude Microsoft Works, Money 97, Creative Writer 2, and Encarta 97 Encyclopedia MPEG. **Compaq Presario 4850.** Street price (without monitor): \$3,000. Compaq Computer Corp., Houston, TX. 800-345-1518; 281-370-0670, fax: 281-518-1442; www.compaq.com.

SONY PCV-220

The Sony PCV-220 offers a slightly different twist on home computing, entertainment, and communications than Compaq's Presario. The unit features an integral television tuner, Sony's VAIO Space interface for those who'd rather not use Windows (the Windows 95 desktop is only a mouse click away, though), and a 100MB Iomega Zip drive. A fully featured family PC, the Sony PCV-220 is a pleasure to use, particularly in conjunction with the optional 17-inch CPD-220VS multimedia display (\$830 street), which offers 0.25-mm dot pitch, a Trinitron tube, a maximum 1,280-by-1,024 resolution, and a 17-watt speaker system with subwoofer and microphone.

WHAT'S INSIDE

The Sony PCV-220 is \$300 cheaper than the Presario 4850; components common to both are a 6.4GB hard disk, a K56flex modem, and a 4MB ATI 3D Rage Pro AGP graphics card. But the Sony unit is also outfitted with a 266-MHz Pentium II CPU and 32MB of SDRAM.

The Sony's medium-gray,

about on this unit, including USB ports on the optional multimedia monitor.

Like the Compaq Presario 4850, the Sony PCV-220 performed well within its CPU class on our benchmark tests when compared with other 266-MHz Pentium II systems (which were tested for this issue's home PC story).

mid-size tower case has a two-piece purple front cover. The top half of the cover slides down to access the floppy disk drive, the 24X CD-ROM drive, the Zip drive, and composite, S-video, and stereo input connectors.

Connections for external input and output devices

IT'S ON TV

If you attach a coax cable to the VHF/UHF connector on the back of the Sony PCV-220, you can watch partial or full-screen television. An included Electronic TV Host application enables you to scan and program all the channels your cable connection receives, and it lets you control such features as closed captioning, channel blocking, and program alarms. The television image quality was best in partial-screen mode with a tighter signal area, but even in full-screen mode the image quality was comparable to most conventional televisions.

Sony's VAIO Space is a 3-D user interface that organizes applications and system utilities. The VAIO Space is easy to use and offers an impressive demonstration of the system's 3-

D video and audio technologies.

The Sony PCV-220's huge selection of bundled software applications gives you all the basics—and then some. Titles include Microsoft 3D Movie Maker and Microsoft Bookshelf, among many others.

Sony PCV-220. Street price (without monitor): \$2,700. Sony Electronics Information Technologies of America, San Jose, CA; 800-476-6972; www.sony.com. Circle 404 on readers service card.

WHICH TO CHOOSE

If you want to watch TV at your desk and are attracted by lots of software, the Sony PCV-220 is a good choice for a high-end family PC. But if DVD plus a complete home communications center is more your bag, look to the Compaq Presario 4850.

Software DVD: A Good Choice?

Compaq's top-of-the-line Presario 4850 uses software rather than a hardware decoder to play back DVD MPEG-2 data. According to the vendor, with a given price point (in this case, \$3,000), their customers preferred greater core computing features than what was perceived to be the barely incremental performance advantages of more expensive hardware DVD decoding.

Compaq's software DVD solution, called SoftDVD, is a collaboration among Compaq, ATI, Intel, and Zoran Corp., whose CompCore division provided the software. Zoran/CompCore SoftDVD performs MPEG-2 video and Dolby Digital audio decoding, 3-D audio, DVD navigation, and copy protection; meanwhile, ATI's 3D Rage Pro graphics accelerator with MMX optimization adds motion compensation. Both are enabled by Intel's 440LX AGP chip set, which is used with Pentium II processors.

Compaq pulls the whole thing together, so users can view full-screen DVD playback on their PCs. According to Compaq, Zoran's MPEG-2 decoder generates video playback at about 17 fps, and the ATI motion compensation adds 6 to 8 fps for an overall speed of 23 to 25 fps. This is

similar to the rates achieved with hardware DVD decoders.

The greatest concern for users is whether software DVD works well enough. The response is mixed, but most say yes. After testing in PC Labs, we found that reactions were mixed in informal jury testing. Nevertheless, all were surprised at how well SoftDVD performed. Movie scenes with broad panning shots in particular showed slight jerkiness, though several viewers didn't see the breaks in smooth motion until they were pointed out.

But even with these minor breaks, many users are likely to be satisfied with SoftDVD performance. Many buyers will likely be happy with SoftDVD, particularly if viewing DVD video is one of several activities for which a computer is intended. Film buffs, on the other hand, may want a hardware solution with incrementally better motion handling.

As hardware decoder prices drop within the next two years, software DVD will likely enable lower-end system buyers to enjoy movies. Conversely, premium PC buyers will pay a little extra money for that last bit of performance attainable with hardware DVD.—BB

A black and white photograph of a man in a dark suit and patterned tie, sitting in a large, dark leather office chair on a city sidewalk. He is holding a laptop computer. The background shows tall city buildings and other pedestrians, creating a surreal scene where office life meets the street.

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that's not a desktop computer.

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First Looks

ENCRYPTION SOFTWARE

Don't Trust Anyone

SynCrypt provides a wide array of encryption and security tools, all with a simple user interface.

By Barry Simon

The Wall Street Journal recently reported a story about hackers grabbing the traffic on a main New York-to-Washington Internet trunk and searching for the word "merger." But even if you aren't worried about insider trading, you should still be concerned about encrypting e-mail and sensitive files if you use public networks to send information.

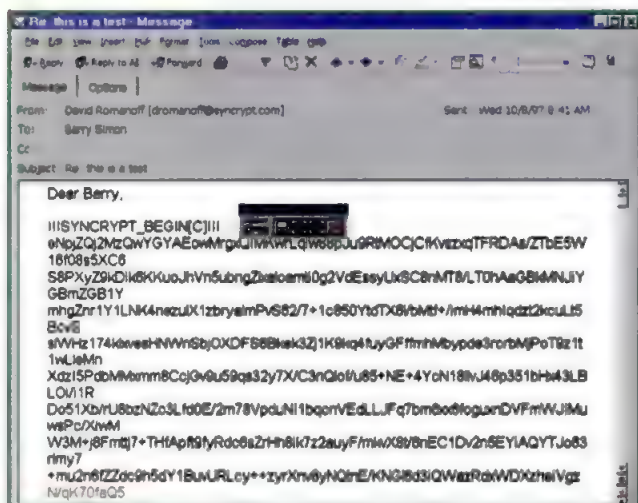
The release last spring of PGP 5.0 ended the era of complicated encryption products. Following this lead, SynData Technologies' new SynCrypt (\$49.95 list) provides the first full suite of encryption and security products.

Once you configure SynCrypt as a small, floating toolbar, you can use it to access many of the program's functions. If you are viewing an encrypted message

that someone has sent through your mail program, all you need to do to decrypt it is click a button on the toolbar. SynCrypt will then send the encrypted text to the clipboard, decrypt it, and paste the readable text back into the mail message. This process works with any mail program (in comparison, PGP requires Eudora or Outlook/Exchange without Wordmail).

To send an encrypted message, you'll need your recipient's public key (your recipient also needs to use SynCrypt). The program allows users to exchange public keys easily via e-mail and set up key servers on a LAN. Unfortunately, official large public-key servers for SynCrypt are not yet available on the Internet.

Encrypting a file is just as simple. Select the file in Windows Explorer or on the desktop and



UNDER LOCK AND KEY: A single click on SynCrypt's tiny floating toolbar will decrypt a message sent through any mail program.

click the encrypt button on the toolbar. Encrypting important local files is even easier; you can specify a directory as your SynVault, which will automatically encrypt files that you drag there.

SynCrypt gives you the ability to use digital signatures and secure deletes. Also, a feature called Bikini encryption allows you to encrypt only selected text

within a message. You can even hide an encrypted message inside the random information of bitmaps and thereby secretly send encrypted information.

Because SynData views current encryption standards (such as S/Mime) as insecure, it uses its own implementation of industry-standard algorithms, including Blowfish, DES, and RSA. We did run into some Version 1.0 limitations and glitches. Since the program is 16 bit, it doesn't display long file names. Nor does it use some of the features of Windows 95's GUI-like context menus. You can't save encrypted messages automatically in a form that you'll later be able to decrypt yourself. But you can tell the program to include decryption information on a case-by-case basis for several users, including yourself (although you do have to remember to include yourself each time).

So long as you and your correspondents are all willing to commit to SynData's approach, SynCrypt represents an excellent choice for your encryption needs. **SynCrypt 1.0.** List price: \$49.95. Requires: 8MB RAM, Microsoft Windows 3.1, 95, or NT; SynData Technologies, Cedar Grove, NJ; 800-499-1469, 973-857-6550; www.syncrypt.com. Circle 402 on reader service card.

Encryption 101

Syncrypt's goal is to make encryption as transparent as possible, but to evaluate different features of encryption programs you need to understand the basics.

To translate text to a code is to encrypt it, and to translate it back is to decrypt it. For either operation, you need a general algorithm and a unique key. Encryption methods are placed in two broad categories. The first is called symmetric, or single key, and uses the same key to encrypt and decrypt. The second is called asymmetric, double-key, or public-key, and it uses different keys to encrypt and decrypt. Public-key encryption assumes that your encryption key can be given out freely. This allows others to send you encrypted messages only you can decrypt, so long as only you have the second private key.

Almost all encryption programs encrypt an entire message or file using a symmetric encryption method with the randomly generated "session" key. They then store the session key encrypted with a public-key

method. Anyone can read such a message once they get the session key, but only the intended recipient has the private key needed to decrypt the session key.

Digital signatures basically use public-key encryption in reverse. They depend on algorithms that have private keys for encryption and public keys for decryption. A signature program computes some number assigned to a message and encrypts it with your private signature key. Anyone can then decrypt the message and confirm that it is unchanged, but only you can encrypt the signature. This all depends on the inability to break the code without a key (a string of bits—zeros and ones). Roughly speaking, doubling the number of bits requires you to square the number of steps needed to break any of these codes.

With current computer technology, 40-bit single-key encryption is easy to break, but 128-bit is regarded as extremely safe. Similarly, safe double-key encryption should have at least 1,024 bits.—BS

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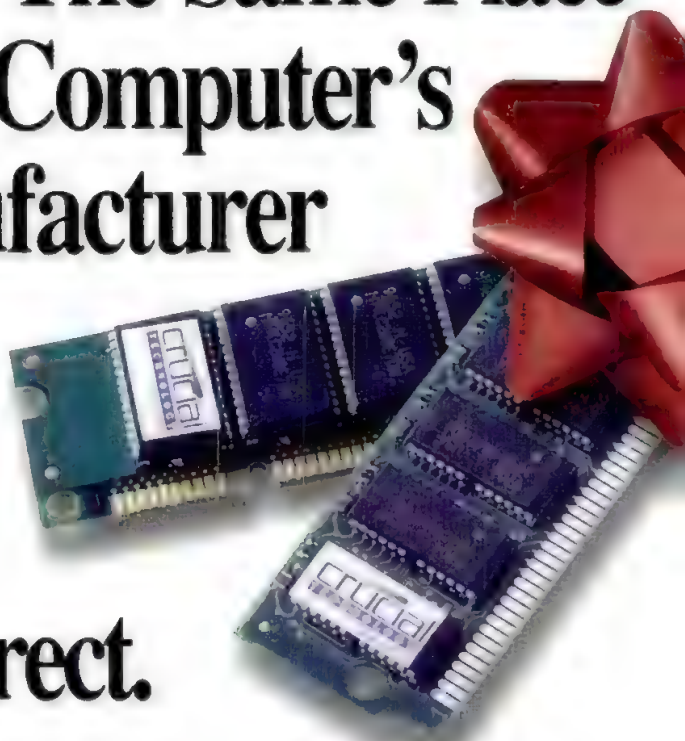
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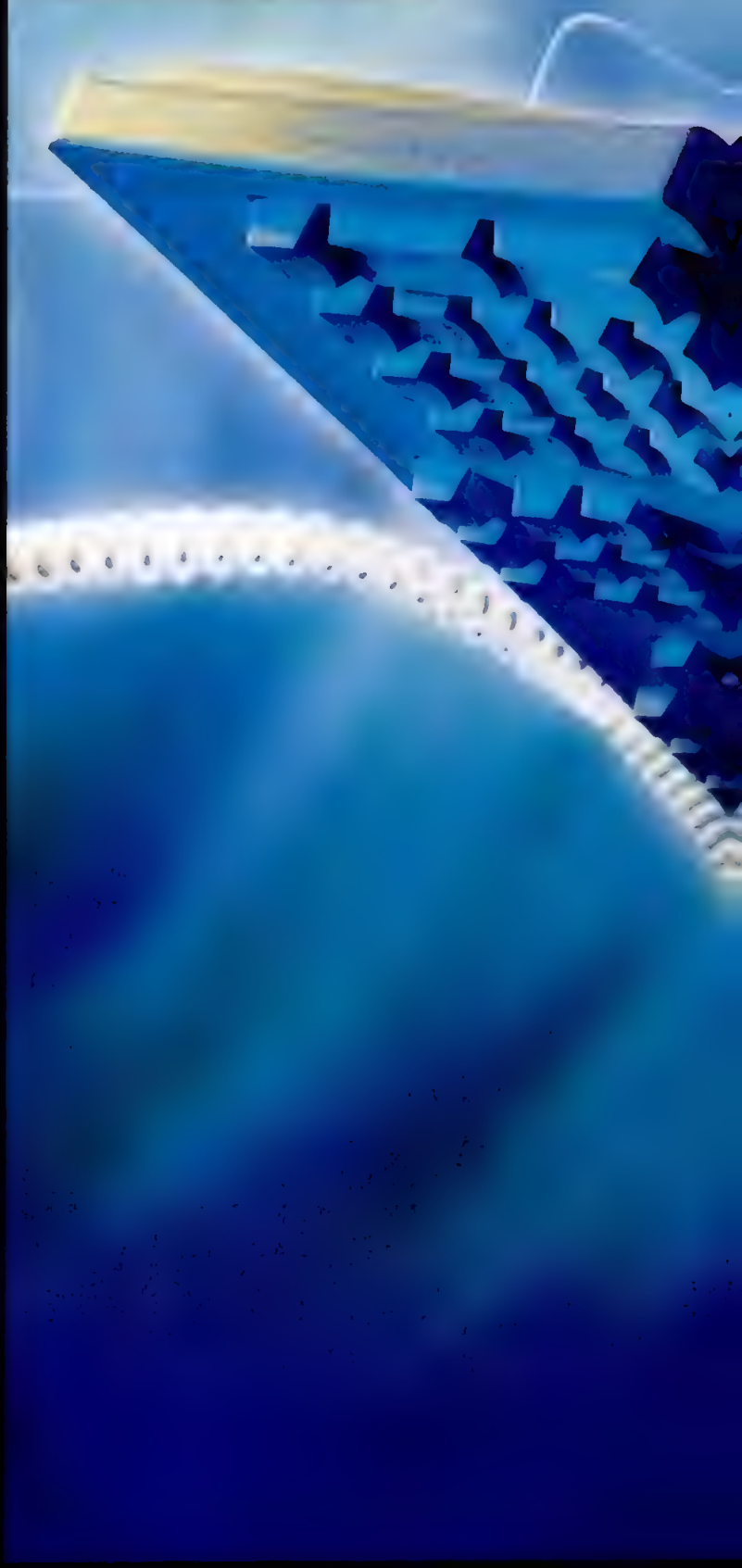
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First Looks

SUBNOTEBOOKS

The X Factor

IBM's ThinkPad 560X goes mobile at 233 MHz.

By Carol Venezia

To say that the best just got better is often an overstatement, but this isn't so in the case of the IBM ThinkPad 560 series. The newest member of the family—the 233-MHz Pentium MMX-powered IBM ThinkPad 560X (\$4,300 street price)—retains all of the award-winning features of its predecessor, the ThinkPad 560E, and it even goes one better on a few key components.

The physical appearance of the ThinkPad has not changed in its newest iteration. Its 4.1-pound black chassis still houses a 12.1-inch SVGA active-matrix display, a 19-mm keyboard with full-size cursor keys, and the fa-

miliar TrackPoint III.

What has changed with this machine is mainly on the inside. First, the processor has been upped from a 166-MHz Pentium MMX to a 233-MHz Tillamook CPU (still with 256K of L2 cache). The machine's memory configuration has also been altered for the better. Now, 32MB of RAM reside on the motherboard; adding one 64MB SO-DIMM brings system memory up to its maximum of 96MB. Inside the ThinkPad 560X you'll also find a 4GB hard disk—double the size of the ThinkPad 560E's hard disk.

Standard ports on the ThinkPad 560X still include serial, parallel, VGA-out, and keyboard/mouse. But on this newest ThinkPad, you now get a USB port along with a connector that

hooks into an IBM Enhanced Port Replicator (a \$180 option).

One aspect of the ThinkPad that appears to be heading in the wrong direction—though unavoidably—is the size of the machine's AC adapter. In order to accommodate the new processor, the ThinkPad 560X's AC brick is nearly double the size of the

impressive showing was on our BatteryMark test: 3 hours 52 minutes. This timing is nearly double that recorded by the ThinkPad 560E (an Editors' Choice in our August portables roundup), due to the

lower voltage of the Tillamook processor.

ThinkPads have been the consistent industry leaders, and this latest

ultraportable is no exception. If you're looking for the most power in the lightest package, the 560X is tough to beat.

IBM ThinkPad 560X. Street price: \$4,300 with 233-

MHz Pentium MMX processor, 32MB RAM, 4GB hard disk, Windows 95. IBM PC Co., Somers, NY; 800-426-2968, 914-766-1900; www.pc.ibm.com. Circle 405 on reader service card.



BENCHMARK TESTS

IBM ThinkPad 560X

High scores are best

ZD Business Winstone 98 (score)	15.5
ZD Business Graphics WinMark 98 (score)	83
ZD Business Disk WinMark 98 (thousands of bytes/sec)	879
ZD CPUmark 99 (score)	415
ZD BatteryMark (hours:minutes)	3:52

ThinkPad 560E. This brings the travel weight up to 5.1 pounds—still keeping it the lightest Tillamook notebook on the market.

On our tests, the ThinkPad 560X performed well. Its most

PENTIUM II WORKSTATIONS

Raising the Bar

HP's new Kayak XU 300-MHz dual-CPU Windows NT workstation brings RAID to the desktop.

By Carol Venezia

Although many vendors have joined the fast-growing Windows NT workstation market this year, few have done so with any distinction. Joining the ranks of the decidedly distinct is Hewlett-Packard's new Kayak XU PC workstation, offering features and functionality that will make the competition green with envy.

The crowning achievement of the Kayak XU (\$7,710 street without monitor) is its advanced SCSI subsystem. The unit's motherboard features an 8-bit ultranarrow SCSI and a 16-bit ultrawide SCSI controller. But what makes this workstation different is its RAID option. The XU can be outfitted with

an Adaptec RAIDport Option (ARO) 16MB disk controller. This card fits into an extended PCI slot on the motherboard; it controls the disk subsystem (a 10,000-rpm ultrawide SCSI), so two disks can be striped (RAID 0) for faster performance.

HP markets the XU as a FAT system under Windows NT, but our testing methodology calls for NTFS. Configured as an NTFS system, according to our high-end benchmarks, the XU's disk performance jumps 26 percent with the RAID option and 64MB RAM installed, as compared to performance with just

one disk. And with 128MB of RAM, the disk performance jumps even higher.

There are many more exciting features housed

inside the Kayak XU. The power supply slides out of the way to expose the system's two Pentium II processors (300 MHz in our test unit; 233- and 266-MHz configurations are also available). There is also a roadmap of board-

switch settings for quick reference if something needs resetting. Other standard features include ECC SDRAM (512MB maximum), an AGP slot for the unit's 8MB Matrox Millennium II graphics board, and an HP Fast Ethernet controller. HP also includes its TopTools DMI 2.0 software, and the unit supports remote power-on and power-off.

Another great feature is HP's FastBoot BIOS. Not only does this BIOS let the machine boot faster, it also lets you disable one CPU in a dual-CPU configuration in software. The BIOS can be recovered from the hard disk if it's corrupted during a flash.

If you're ready to step up to the Intel/Windows NT workstation big leagues, then you're ready for the HP Kayak XU.

HP Kayak XU. Street price: \$7,710 with two 300-MHz Pentium II processors, 64MB of RAM, 24.5GB hard disks, Adaptec RAID controller. Hewlett-Packard Co., Mountain View, CA; 800-322-4772; www.hp.com. Circle 406 on reader service card.



BENCHMARK TESTS

HP Kayak XU

	64MB RAM, RAID	64MB RAM, no RAID	128MB RAM
High-End Winstone	32.8	33.0	34.1
High-End Graphics WinMark	155	172	157
High-End Disk WinMark (thousands of bytes per second)	6,740	5,360	7,320

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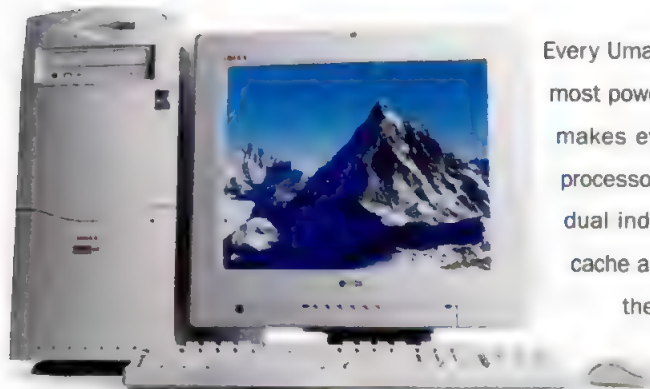


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- 56K Internal Data/Fax Modem
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First Looks

DATABASE SOFTWARE

File It on the Web

Claris's FileMaker Pro 4.0 brings simplified cross-platform database management to the Web.

By Greg Alwang

Long the end-user database of choice for Mac devotees, FileMaker Pro has gone through a major maturation process to become a powerful, Web-enabled relational database platform for Mac and PC users alike. FileMaker Pro 4.0 (\$199 list) retains its popular "design-as-you-go" concept and adds some uniquely integrated connectivity features that simplify the development of Web-based databases.

INTERNET READY

Claris has cleverly integrated a Web server into FileMaker Pro, allowing Windows 95 or Windows NT users to publish databases to an intranet without a separate Web server. This feature makes FileMaker Pro ideal for small workgroups that must share data on an intranet or the Internet but don't have the resources either to install a full-blown Web server or program a complex Web application. Granted, FileMaker Pro's Web server does not support the extensibility features of a dedicated Web server; nevertheless, it transparently provides secure Web database connectivity with virtually no additional learning curve.

Users familiar with previous versions of FileMaker Pro can publish their databases on the Web by enabling the new Web Companion plug-in and selecting a protocol—TCP/IP, IPX/SPX, or AppleTalk. The Web Companion provides CGI capabilities and feeds information to Web browsers in the form of HTML pages and custom-format files created using the Claris Dynamic Markup Lan-

guage (CDML). CDML is a proprietary add-on to HTML that provides HTTP hooks to FileMaker Pro databases. If you keep things simple, you don't have to know a thing about HTML or CDML—FileMaker Pro handles all the basic connectivity for you.

Several tools are available to help developers extend their FileMaker databases on the Web. The CDML Tool is a custom FileMaker Pro database

database. The Web Security Database option provides robust control over access to databases, such as the ability to browse, create, edit, run scripts, and search fields. Using either security option, you can protect your critical data from prying eyes.

PUT YOUR DATA TO WORK

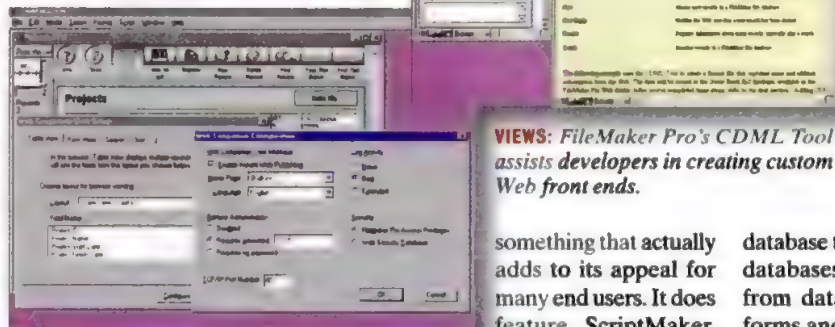
Unlike Microsoft Access 97 and Lotus Approach, FileMaker Pro does not come with a full-blown programming language—

which automatically converts spreadsheets to FileMaker Pro databases when you drop them on the FileMaker program icon. This feature will come in handy for those power users who have outgrown Excel's capacity as a database. Claris has also stepped up FileMaker's graphic support with a built-in graphic file converter, which converts non-JPEG images stored in a database to JPEG format on the fly (so they can be displayed via

a Web browser).

Other new features include the ability to establish sorted relationships and rotate objects on forms and reports.

Staying true to form, FileMaker Pro allows database novices to get off the ground in no time with over 40 sample databases and ready-to-use



CONFIGURE: FileMaker Pro's Web Companion configures your default home page.

VIEWS: FileMaker Pro's CDML Tool assists developers in creating custom Web front ends.

something that actually adds to its appeal for many end users. It does feature ScriptMaker, however, a strong scripting tool that allows users to pick from lists of script events. This makes it easy for nonprogrammers to automate tasks in their custom databases.

Send Email, a new script command, lets you send a message with or without a file attachment from a FileMaker Pro database using any VIM or MAPI-compliant e-mail program. FileMaker Pro even lets you build an e-mail recipient list from search results, making it ideal for mass mailings or ListServing.

Also new is the Open URL command, which can be attached to a button on a form and associated with a URL address stored in a text field. Clicking the Open URL button invokes your browser and jumps to the designated URL.

A useful new feature is the Excel drag-and-drop import,

database templates. The sample databases are comprehensive, from data structures to input forms and report layouts. FileMaker Pro also includes Web-enabled samples, such as a shopping cart and a guest book. For database beginners looking for more guidance, the installation CD comes with an on-screen interactive tutorial.

FileMaker still offers an excellent solution for seamlessly sharing data across Mac and Windows platforms without forcing you to learn a complex programming language. Now that you can publish your databases instantly to the Web, FileMaker presents a truly viable and affordable alternative for small offices and corporate workgroups. **FileMaker Pro 4.0.** List price: \$199. Requires: Microsoft Windows 3.1, 95, or NT 3.51 or higher or Mac OS System 7.1 or higher, 8MB RAM, 35MB disk space. Claris Corp., Santa Clara, CA; 800-544-8554, 408-727-8227; www.claris.com. Circle 403 on reader service card.

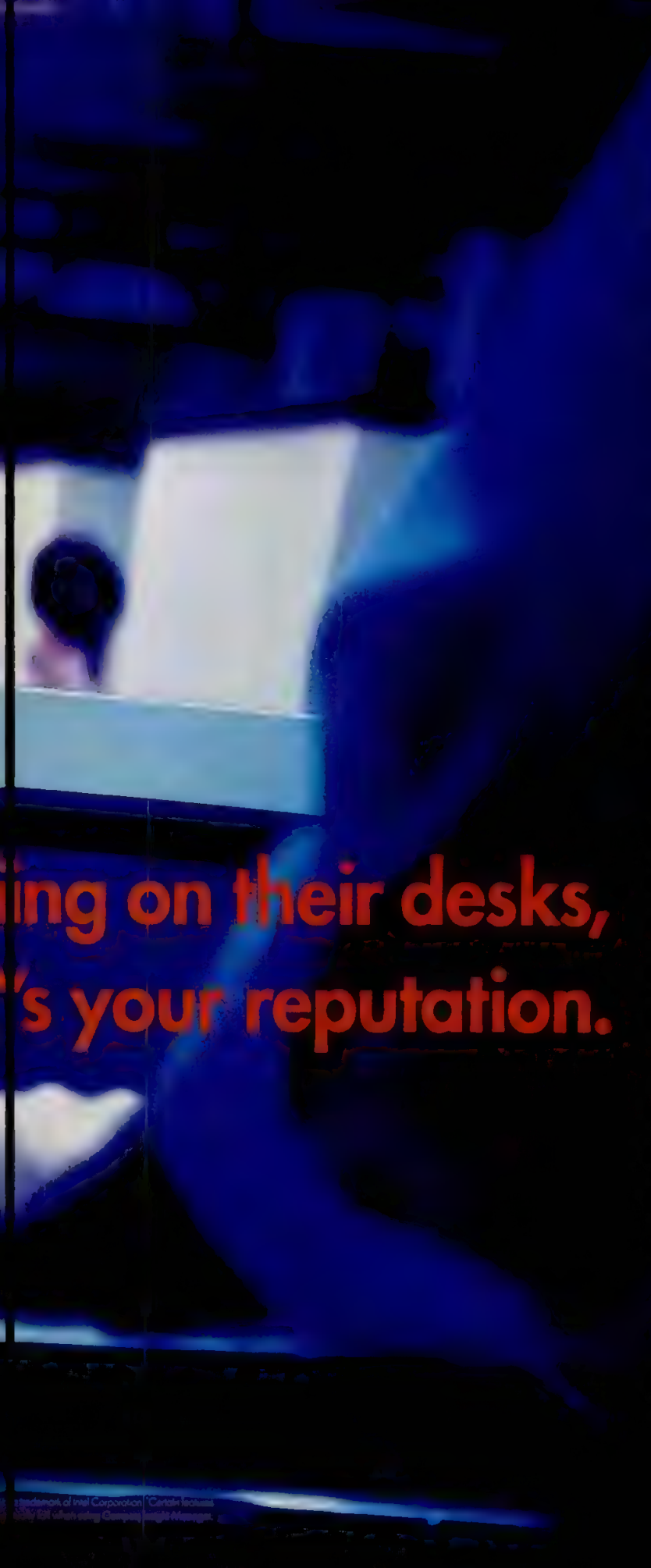
that works with any HTML editor and provides lists of HTML tags and parameters specific to the database you're connecting to. Included on the installation CD are CDML template files for creating Web pages that accomplish basic database tasks (adding and deleting records or performing searches).

CONTROLLING ACCESS

When you publish a database to the Web, you can either use a built-in home page, which lists the available shared databases, or create your own home page using an HTML editor. For Web security, you can use FileMaker Pro's built-in Access Privileges or a special Web Security Database.

FileMaker Pro's built-in security controls permission to view and edit fields and layouts in a

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COMPAQ

First Looks

IMAGE EDITING

Back to Nature

MetaCreations' Painter 5 brings new natural media effects to an already indispensable image-editing program.

By Luisa Simone

With the release of Painter 5 (\$300 street price), Fractal Design—now MetaCreations—has once again upped the ante for electronic image creation. A new extensible architecture opens the door to plug-in functions, with the result being over 100 new brushes as well as object-oriented floaters.

The brand new plug-in brushes work the same way as Painter's basic tools. To use them, you simply load a new library, pick the appropriate variant, and begin painting. Seven brush libraries are automatically installed, but nine additional collections can be found on the CD.

The image-editing tools let you apply traditional darkroom techniques with the expressiveness of pressure-sensitive brushes.

Using the F/X brushes, you can paint with fire, glows, and bubbles. The Goosy brush variants can twist, pinch, and bulge a picture as though it were silly putty.

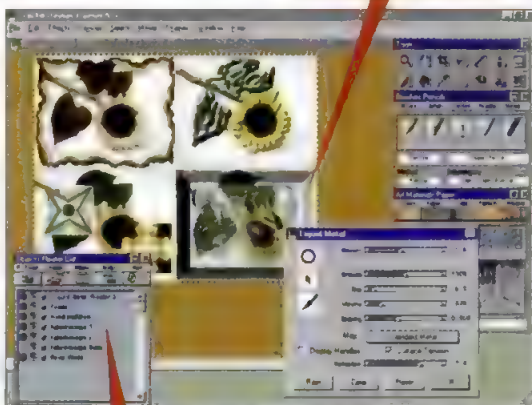
DYNAMIC FLOATERS

Plug-in technology is also responsible for bringing in a whole new class of floating objects. Unlike normal floaters (which are static bitmaps), plug-in floaters are dynamic painting layers or lens effects. The image-editing filters are conceptually similar to Photoshop's adjustment layers. These filters overlay and alter existing imagery. And because they are maintained as separate layers, they produce a live effect. You can move the dynamic floater around the canvas and change its

parameters to alter the effect.

Dynamic floaters can produce such exciting visual effects as impasto painting layers, faceted kaleidoscopes, gooey distortions, and burned, torn, or beveled edges. The Liquid Metal feature blurs the distinction

SPECIAL EFFECTS:
Painter's plug-in floaters create these Liquid Metal droplets.



SHORTLIST: The dynamic floaters are listed in the object floater palette and remain editable.

between 2-D bitmapped paint programs and 3-D object-oriented modeling programs.

For example, metal droplets can be formatted with physical properties (such as size, surface tension, and reflectivity) and can interact with the other objects in a painting. Format a drop to refract light as water would and it will magnify the image beneath it. Change the parameters and load an environment map and the same droplet will reflect light as metal would.

Though Painter remains firmly entrenched in the world of RGB im-

ON FIRE: With a simple brush stroke, you can create special effects such as glow and fire (below).



ages, support of Kodak's Color Management System (KCMS) provides a CMYK preview of the printed output. The KCMS module ships with ICC profiles that can convert RGB paintings to CMYK or Hexachrome values—provided you are printing to a PostScript device or generating EPS-DCS files.

FAMILIAR TOOLS

Painter has abandoned its selection and masking tools and replaced them with industry-standard functions. The Selection menu allows you to modify areas by using Photoshop-style commands. Cropping is a fairly straightforward function on the toolbar, and you are able to save up to 32 alpha-channel masks with an image.

Creating custom tool, paper, and command palettes provides a real productivity boost. In fact, a custom palette provides one-click access to all of the new brush libraries. Painter also leverages its ability to edit movies with an output option for animated GIFs, a feature that will appeal to Web artists.

During our testing, we discovered that many of the program's new

functions are computation and memory intensive. The performance hit is most noticeable with the Camera Motion Blur and Depth of Field filters. For example, applying a Depth of Field blur to a relatively small image (1,200 pixels square) required nearly two minutes of processing time on a 200-MHz Pentium PC with 64MB RAM.

Dynamic floaters also exhibit intrinsic limitations. You cannot associate two dynamic floaters with an object. You must commit one of the effects to the paint layer, turning it into a static, uneditable effect. We also experienced insufficient-memory error messages when painting in the impasto layer. At times, it feels as though new features have been shoehorned into the existing user interface.

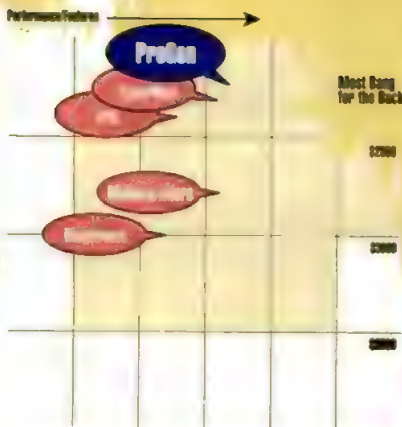
Painter continues to support the older Photoshop 3.0 plug-in specification. This means that it can't use third-party filters conforming to the Photoshop 4.0 specification.

This version of Painter adds image-editing tools and automated special effects that will appeal to a broader range of business and casual users. Paradoxically, the heavy demands the program places upon system resources and the steeper learning

curve may scare those same users away. But for Painter's core user base (serious artists and professional illustrators), the incredible new tools are too good to resist.

EASY ACCESS:
Painter's new plug-in brushes are easy to get to, thanks to the new shortcut palette.

Fractal Design Painter 5. Street price: \$300; upgrade: \$99. Requires: 486DX or better CPU, Windows 95 or NT 4.0, 16MB RAM (32MB for NT), CD-ROM drive, SVGA graphics adapter. MetaCreations Corp., Carpinteria, CA; 800-297-2665, 805-566-6200; www.metacreations.com. Circle 401 on reader service card.



Source: PC Buyer's Guide, PC Magazine, June 24, 1997

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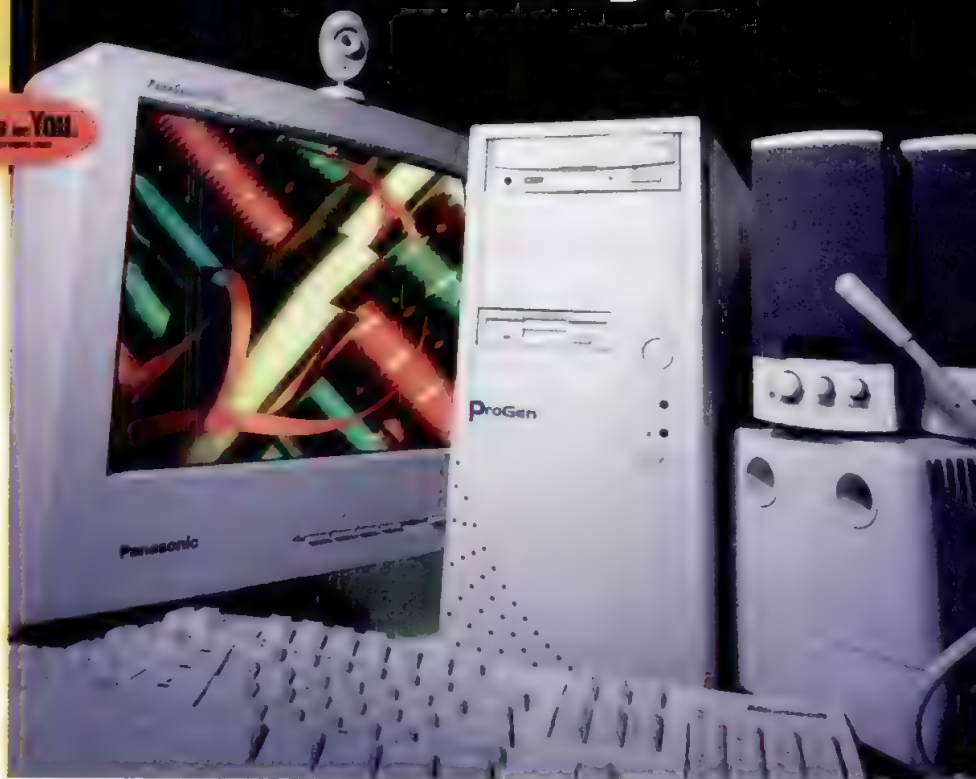
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ProGen Polaris 233 Score: 30.4

Micron Millennia ProZ 233 Plus Score: 23.1

Source: Computer Shopper, July 1997

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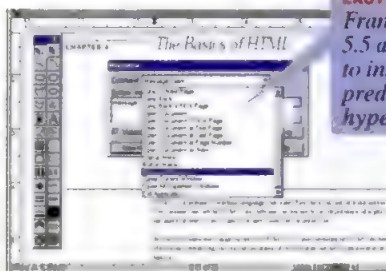
ADOBE FRAMEMAKER 5.5

Friendlier FrameMaker

In our last review of Adobe FrameMaker 5 ("The PC Palette," April 22, 1997), we had high praise for its long-document creation and management tools. But we also felt that the program's interface sometimes made operations unnecessarily complex. Version 5.5 (\$895 list; \$175 upgrade until February 28, 1998) boasts several improvements that make FrameMaker's basic functions more accessible (context-sensitive shortcut menus and ToolTips, for example).

Building interactivity into an electronic publication is also much easier. This is attributable to the new Hypertext insertion palette, which provides English-

language commands and a simple syntax (thus eliminating the complicated procedures and obscure codes that were necessary with the previous version). The ability to validate a hyperlink



EASY HYPERTEXT: FrameMaker 5.5 allows you to insert a predefined hypertext link.

(such as a URL or a destination marker) upon insertion is truly helpful. This incremental improvement still needs work, though, because FrameMaker does not provide a list of existing insertion markers. It also can't

grab HTML documents or URLs from the Web.

FrameMaker 5.5 can now directly save HTML or .PDF files. It accomplishes this by totally integrating the functions of the HoTMetaL plug-in HTML export filter and by automatically invoking Acrobat Distiller.

There have been numerous enhancements to the HTML output, including import filters for Web graphics formats (specifically GIF, JPEG, and PNG), the ability to generate a client-side image map using a button matrix, and automatic conversion of anchored pictures to the GIF format. We were especially impressed with the program's ability to generate a series of linked HTML documents from either a book publication with multiple chapters or a single complex publication with multi-

ple sections. FrameMaker still doesn't support frames, however, making it impossible to maintain multiple-column layouts.

Our original review also noted that FrameMaker left the task of producing design-intensive, commercially printed publications to its sibling program, Adobe PageMaker. For the most part, the situation has not changed, although user-defined tints and 12 new color libraries make it easier to specify colors. FrameMaker 5.5 addresses the needs of service bureaus, but only in the Macintosh version.

Adobe has turbocharged FrameMaker's already strong table tools with the ability to perform alphanumeric sorts. The vendor has also rolled the Japanese version of the program into Version 5.5, but you'll need a Japanese operating system and the correct fonts to use the new Japanese-character typographic functions.—Luisa Simone

MICROSOFT INTERNET EXPLORER 4.0

Fill In the Blanks

Microsoft Internet Explorer 4.0 is incompatible with features in at least two popular software packages that make use of IE components to display Java and other program code. PC Labs has discovered that some screens or screen regions in Adobe PhotoDeluxe 2.0 and Symantec's Norton Utilities for Windows 95 2.0 appear completely blank when they are run after IE 4.0 is installed on a PC.

Both programs install and use IE 3.0 within their own application windows to display some of the browser's content. A Microsoft representative explained that the problem is tied to the implementation of certain HTML tags that now act differently with the new browser. Adobe and

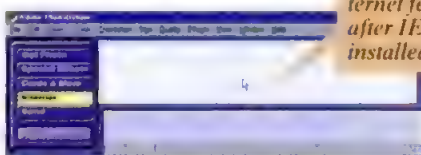
Symantec both confirmed the problem and plan to have patches available on their Web sites by the time you read this.

PhotoDeluxe 2.0 uses an Internet panel that includes wizard-style photo-enhancement tasks that the program runs directly from Adobe's Web site (if you have a connection to the Internet). This panel also includes other links to online photo services provided by FujiFilm, Kodak, PhotoNet, and Pictra. It normally displays text and images in a tabbed interface.

When you install IE 4.0, the entire panel displays as blank space and is unusable. An Adobe technician explained to PC Labs that IE 4.0 requires dif-

ferent placement of Java code in HTML pages than was required in IE 3.0. Adobe is working on replacements for the pages that PhotoDeluxe uses to display its Internet panel.

Similarly, the Norton Utilities Overview application normally displays a summary of programs included in the package. After IE 4.0 is installed, the program screen is blank and unusable. Sy-



ALL GONE: This blank space is all that's left of PhotoDeluxe 2.0's Internet features after IE 4.0 is installed.

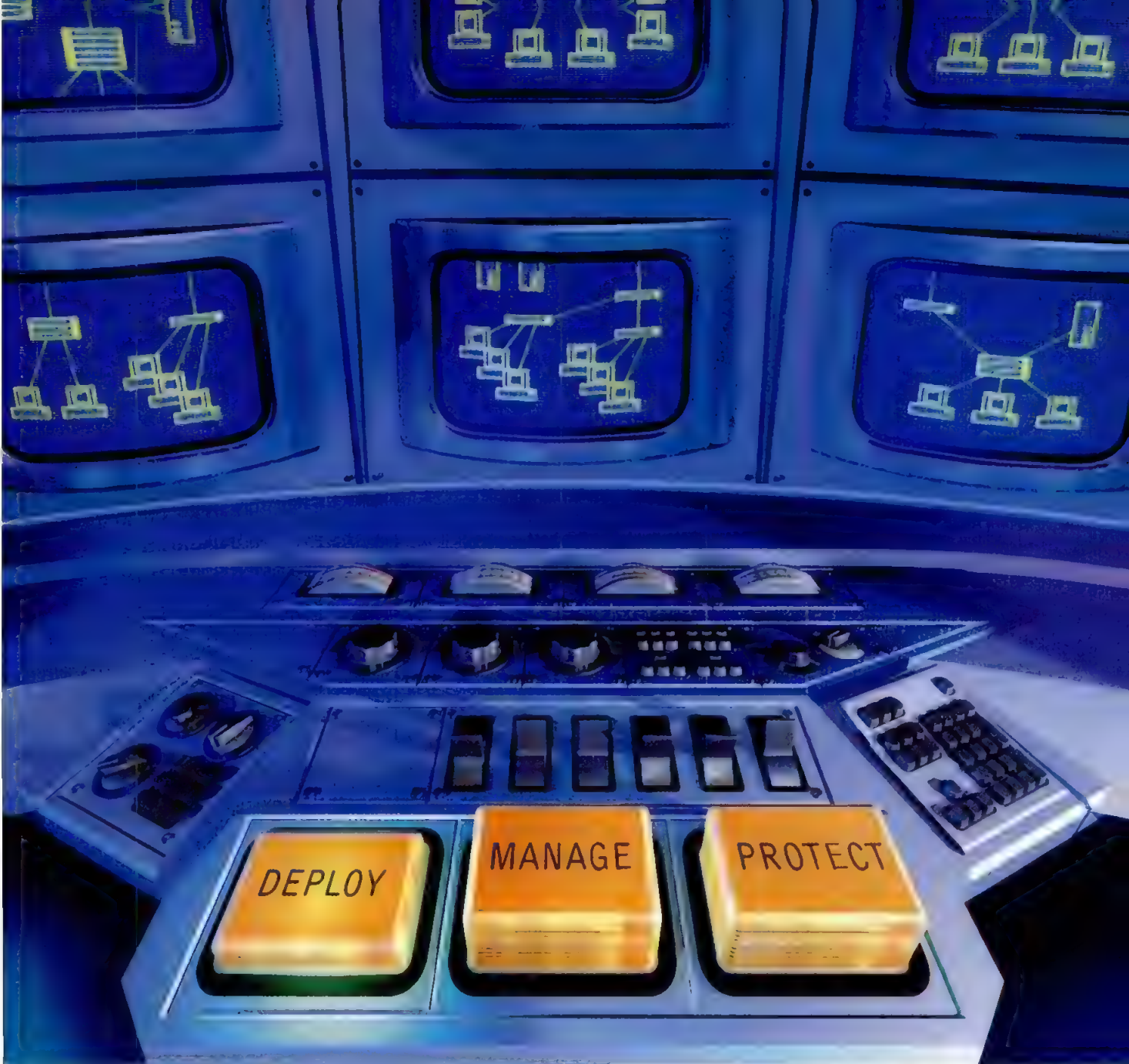
mantec plans to fix the problem by posting an upgrade, which will be accessible through the Live Update feature built into Norton Utilities' System Doctor.

The README file that comes with IE 4.0 lists a number of incompatibilities, but these

are not among them. One problem listed in Microsoft's README file concerns Norton Utilities 2.0 and warns that if you install the optional Active Desktop component of IE 4.0, the Norton Utilities Recycle Bin will no longer work correctly. Symantec confirms that with Active Desktop installed, Norton Utilities' Uninstall wizard will be able to restore only deleted files stored in the Protect directory, not the main Recycle Bin.

The problem with Norton Utilities' Overview occurs whether or not Active Desktop is installed. The patch file that Symantec plans to post will fix the Recycle Bin problem in addition to the problem with Overview.—Edward Mendelson

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Landscape/Portrait Modes	Yes*	Landscape	Yes*	Yes*
OnView™ Controls	Yes	Yes	Yes	Yes
ViewMatch™ Color	Yes	Yes	Yes	Yes
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*Without supplied Perfect Portrait™ software. May not be compatible with all software.



Beat Those Winter Blues

Winter is here. Time to do some serious cocooning on these long nights and try something that's good for your soul: make music, with the help of your computer. Piano and guitar are the two most popular musical instruments, and for good reasons.

You get pleasing results after a reasonably short learning period. You don't have to stick anything in your mouth; you're free to smile, converse, even sing. Both instruments produce a wide range of tones, sufficient to cover accompaniment and lead duties. Both offer infinite possibilities in new songs and new styles.

Whether you play an instrument now or have always wanted to, your computer is ready to help. Computer-assisted musical instruction has been around for a long time, and it keeps getting better. MIDI keyboards have revolutionized the industry, as they can simultaneously produce a full range of synthesized tones and data streams that a computer can understand. Your computer can watch what you play, correct your errors, and offer words of advice and encouragement.

Guitars were all but excluded from this instrument/computer relationship until G-Vox (www.gvox.com) introduced its pickup. Yes, MIDI guitars have been around for a while, but they're expensive, electric-only instruments. You can attach a G-Vox pickup to any steel-string guitar (although it works best on electrics and guitars with low resonance characteristics) and thereby plug into a new world of interactivity.

One of the best keyboard instruction programs I've seen lately is Midisoft's Play Piano 2.0. It's fairly intelligent, as instructional programs go, having you play the left and right hands separately and then together. It identifies a passage where you made a mistake and highlights it for you, then has you repeat it until you get it right. If you continue getting it wrong, it slows the tempo until you can play the passage successfully. I found this latter feature irritating, since I was having a problem independent of speed: playing what was in my head instead of the notes that Play Piano presented to me. I needed to practice, but I found the ever-slower pace disconcerting. Still, I got the feedback I needed, as the program's voice told me, "You need more work on this section." I actually felt a small thrill of victory when it finally said, "You played that perfectly."

All piano instruction is fundamentally the same: Read the

music, play the notes. Guitar instruction is vastly different. Except for classical guitar, there's less emphasis on sight playing from sheet music. Most guitar instruction is a kinesthetic experience. You watch the instructor play a passage, then you play it. Ubisoft's excellent *Classic Rock Guitar, Volumes 1*

and 2, is a shining example of the see-and-do school. Alfred Music's *Guitropolis* is more scholarly, a beginners' guitar course with an annoying "game" front end pitched primarily at children and young teens. Fortunately, you can bypass the game and go straight to the lessons. These lessons, a big improvement on Alfred's well-regarded guitar method books, include accompaniments that get you used to playing with a band right from the start.

G-Vox's Guitar 101 (coproduced with Fender) is a departure because of the G-Vox pickup: The computer can see what note you're playing, on which string. Even if you don't use the pickup, Guitar 101 is a thorough, enjoyable course that trains you to be a guitar hero. While most other courses start you playing chords and open strings at the nut, Guitar 101 starts you at the seventh fret. The accompaniments are funky and hip. With the pickup the software watches what you play and tells you when you've made a mistake. You can also drive synthesizers, sequencers, and composing programs from your guitar.

I've extolled the virtues of PG Music's Band-in-a-Box often before (www.pgmusic.com). It remains a wonderful program, with virtual musicians that

never tire of playing what you want to play. But if you're into serious composition, you owe it to yourself to try Jammer (www.soundtrek.com). Jammer doesn't have nearly as many musical styles as BIAB, but it far exceeds BIAB in its ability to create fresh arrangements. Jammer breaks songs down into intros, grooves, fills, breaks, and endings. Click the "compose" button within any measure and Jammer comes up with a new part for any or all instruments. I was able to import arrangements I'd made in BIAB into Jammer to refine and embellish them—the best of both worlds.

So practice a bit and nip those winter blues in the bud. Or better yet, play them for yourself or your friends. **PC**



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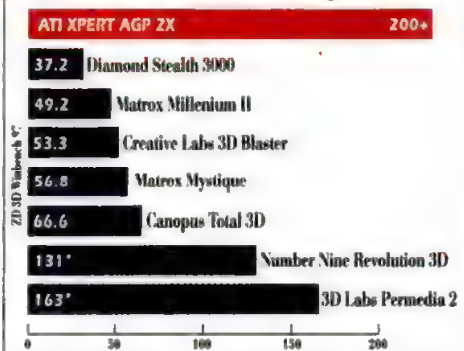
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AGP 3D Performance Comparison



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Out-of-Box Experience

Online software sales are nothing new, and a variety of schemes have been proposed in the past—few of which were successful. Suddenly, the numbers are changing, and it seems that online sales will soon become the primary method of software distribution.

Over a decade ago, I saw one of the first presentations of downloadable software sales. Actually, I saw a number of schemes in the late 1970s and early 1980s proposing that software be sold through kiosks, which would download the latest versions of commercial packages, produce disks, and print out documentation.

None of these ideas met with any success, as people still preferred to window-shop and buy real software in real printed boxes. Merchandising ruled, as witnessed by an era of oversize boxes sold at computer and software stores.

The next iteration of direct sales came during an era of shareware, which began almost simultaneously with the introduction of the IBM PC. As modem speeds increased, this method became more popular, but the market was limited by the apparent complexity of the online world. This issue was resolved by the sudden emergence of the Internet, the World Wide Web, and point-and-click methodology. Combine ease of use with a growing online user base and the potential for online sales increases. To that growing potential add the deterioration of selection in stores and the general inability of stores to keep up with version changes. The obvious result is increased direct sales over the Internet.

This trend was recently borne out by some interesting observations and statistics published by Michael Tchong, founder of *MacWeek*, who now publishes the newsletter *Iconocast*. He notes that a recent study indicated that direct sales of software last year were up to 20 percent, from 13 percent the year before. But Tchong asks: "So why is selling software electronically via the Internet not a bigger trend? . . . Cyberian Outpost CEO Darryl Peck tells *Iconocast* that while ESD [electronic software distribution] may be fine for corporate users, consumers still prefer physical 'ownership.' In effect, consumers are saying: 'No touchy-feely, no buyee!' A recent *World Research* survey of 930 respondents found tactile feedback the third most frequently mentioned objection to e-commerce." Curiously, the most frequently cited reason for not buying software (or anything else) online was "fear of being

robbed by hackers," followed by lack of selection. Neither of these excuses makes much sense, and I am led to believe that a boom is imminent.

When users were asked what they would buy if they were going to buy anything online, 79 percent said software,

which was followed by airline tickets, music and videos, and hardware. Tchong cited figures from an IntelliQuest study, which indicated that 11 million PC users in the U.S. routinely download software from the Internet. Finally, Forrester expects that by 1999, half of all software will be sold electronically.

Over the years, small-time software developers have been mostly squeezed out of stores by Microsoft, Lotus, and other big players. In today's environment, most software companies literally have to buy shelf space, and their products must sell well to stay on the shelves. Newcomers to the market must have compelling products and a lot of financial backing to be successful. No wonder companies have to start out selling direct and hope to have download success stories to enable them to turn the corner.

But there are a slew of newcomers that intend to sell most of their software direct, over the Internet, with no packaging. In my *Inside Track* columns over the years, I've highlighted small-fry software companies with superior little programs. Over the past two years, almost all of these companies have wanted people to download and pay for software over the

Internet. The savings afforded to the small vendors that use this technique is enormous. This is a perfect self-service model: another version of the Internet vending machine.

Actually, I've been getting a lot more software this way too: It's much more convenient, and in this era of "Internet Years" in which Time = Money², it's an efficient way of doing things. While I do believe that there is something to be said for merchandising and printed documentation, the fact is that I always lose or throw out the documentation anyway. Most users are beginning to realize that software doesn't need to be in a big box. As online merchandising techniques are perfected, you can kiss software-in-the-box good-bye.



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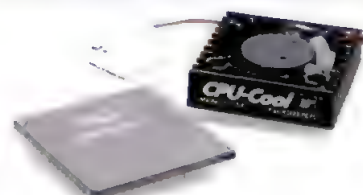
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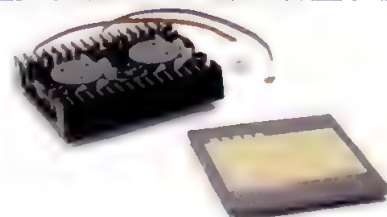
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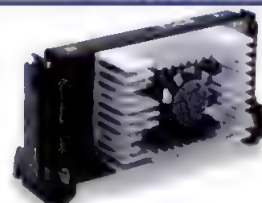


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Inside Track

Intel is in the news again, since the company appears to be getting serious about using **symmetric multiprocessor (SMP)** systems as super servers.

We're talking about four- to eight-processor Pentium Pro systems designed to compete with high-performance servers. So Intel bought Corollary Inc., which specializes in the design and implementation of SMP chip sets and motherboards. The idea is that Intel and the architects from Corollary will begin to design new boards for the **next-generation Intel chip**, code-named Deschutes. These will be eight-processor systems, for starters. At the same time, many Intel customers have started to work on designs of their own. The next generation of Intel machines will also target the big iron from IBM, Digital, and Sun. **Intel über alles!**

The irony of these systems is the **relative sluggishness** of operating systems (namely, Windows NT). The buzz at NetWorld+Interop was over **gigabit Ethernet**: It was all anyone was talking about. Numerous players are in this game, led by Packet Engines: Figure about \$1,000 per port to play. Anyway, the **sub-buzz** at NetWorld was over the fact that Windows NT can't seem to get close to **pumping out data** fast enough for the new switches. I heard numbers like 150 Mbps to maybe 300 Mbps coming out of a Windows NT-based system. On the other hand, Novell seems to be able to handle the load, and more than a few people claim that it can go full speed. **The truth** will begin to shake out in the months ahead. It's now clear that gigabit Ethernet is where everyone is headed.

New Technology Dept.: The American-dominated game of follow the leader may be ending. At the recent European Solid-State Devices Research Conference, the chitchat centered around the development of semiconductor devices made with **silicon germanium (SiGe)**, which can handle higher frequencies with less noise than either silicon or gallium arsenide. Sounds like military applications to me; hence the interest. These chips should also make **great low-noise amps**—like those that boost the signal from a satellite downlink—even more efficient. To consumers, this means even smaller dishes! I expect that we'll be wearing dinky **satellite dishes on our heads** someday. There may also be computer applications for silicon germanium. Its ultra low power requirements have an appeal. Also, the stuff is deemed "silicon-compatible," meaning the chips can be run through current silicon-chip fabrication facilities.

While on the Subject of Chip Fabrication Dept.: Another new technology is emerging for the next iteration of chip manufacturing. As you know, geometries of

*The buzz at
NetWorld+Interop
was over gigabit Ethernet:
It was all anyone was
talking about. Numerous
players are in this game,
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Ethernet is where
everyone is headed.*

chips have dipped to **0.25 microns and are headed smaller**. But the new, smaller sizes will require any number of new technologies, such as X-ray or electron-beam. If you want to drop the latest buzzterm at a cocktail party, try **"ion-projection lithography."** Again, this is out of Europe, where they hope to have 0.1-micron technology working by the year 2000.

More Confusion in the DVD Ranks Dept.: I laugh out loud every time I read about more dissent in the world of DVD. Now it's over audio standards. At the recent Audio Engineering Society convention, **two totally incompatible** DVD audio formats began a tussle. Once more, it's Philips and Sony taking one side and everyone else taking the other. The Philips/Sony proposal is something called Data Stream Direct

(DSD). This is pitted against a linear pulse-code modulation (LPCM), which was the original specification for DVD audio. Remaining in the LPCM camp are JVC, Panasonic, Toshiba, and most of the DVD consortium.

DSD is an extremely aggressive approach to putting sound on disks, and it actually **requires technology changes** at the recording-studio level. Who is supposed to pay for that? It just doesn't look as if DSD's going to get off the ground. And with most users playing CDs on boom boxes or car stereos, the technology obviously appeals only to a few aficionados. Still, the DSD proposal further **mucks up** the deteriorating situation with DVD.

The real nail in the coffin for DVD, though, comes from its original enemy, the VCR. And by this time next year, the newest iteration of the VCR—the **digital VCR**—should be taking over the market. The first such device, which is backward-compatible with standard VHS, comes out this year. The digital VCR will be bundled with a DBS satellite dish from which it can record MPEG-2 movies **right from the digital feed**. The deck can also accept an IEEE 1394 digital feed from a digital camcorder or just record from broadcast TV digitally. I believe that much of the hype surrounding the D-VHS deck has been kept to a minimum because of its ability to make perfect copies; the opportunity to dub rented videos is hard to resist. As the home becomes more networked, it has no reason not to network in a D-VHS and use it as a massive backup device. A D-VHS cassette will hold **44 gigabytes of data**, and that number should increase over the next few years. JVC, the company that pioneered both VHS and D-VHS, also expects to produce an HDTV version of the system for super high resolutions. The curious aspect of all this is Japan's fear that D-VHS won't be a success. In fact, this device will **take the USA by storm** and swamp DVD. **PC**

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Christmas PC Buying, Part 1

What a year! The buzzphrase about 1997 in the PC world is that it has been only "an evolutionary year," and that's true enough. But don't think that "mere" evolution means dullness or mediocrity. This has been a year full of great new and newly refreshed

products. At year end, with the Christmas season upon us, you probably feel a little cash burning a hole in your pocket. Herewith some tips on great new software you may want to indulge in. Next issue I'll look at great new hardware—just in time for your last-minute Christmas purchases.

The two most interesting software products of the year were both upgrades: Microsoft's Money 98 Financial Suite and Adobe PhotoDeluxe 2.0—both, tellingly, from the consumer side of the aisle.

With so many newbies pouring into the market, buying those sub-\$1,000 PCs that nearly took over PC retail sales during the last two quarters, we probably shouldn't be surprised at the effort, investment, and intelligence being focused on the consumer market. Facing a saturated business market versus a wide-open consumer market, software developers know where to place their bets.

Money 98 Financial Suite is Intuit's worst nightmare. For the first time, Money 98 overtakes Quicken in nearly every area—from what is simply the richest, deepest, most elegant interface in PC software today to effective integration with a Web site. Moreover, the level of intelligence Money 98 displays as it walks you through setting up accounts, entering data, then managing your money is astonishing. It truly deserves the "financial suite" moniker, with apps (Advisor FYI and Goal Planner, for example) that stretch well beyond the checkbook-manager level of earlier releases of Money and Quicken.

Money 98 also has gorgeous screens that put Word, Excel, and the rest of Microsoft's high-dollar business applications to shame. Tell me, please, Bill, why almost all business software, including yours, is so ugly—when you obviously have the program-design and graphic-design skills that produced Money 98 (at \$25 street)?

PhotoDeluxe 2.0 isn't quite so big a leap forward, but it's close. In Version 2.0, Adobe finally corrected the irritating little things in earlier releases—with improvements ranging from an easier-to-understand path toward creating projects to a much better red-eye-removal routine. "Photoshop, Jr." is still a long way from its high-end sibling, but that's by

design: PhotoDeluxe is Everyman's photo editor. At \$55, it may be the bargain of the year in PC software.

MetaCreations' Kai's Photo Soap belongs on your Christmas shopping list, too. The interface is 100 percent Kai: quirky, unlike anything you've ever seen, coy, and

sometimes cloying. But the power behind that beautiful face is what will really hook you. You can't just jump into Photo Soap as you can with PhotoDeluxe, but if you'll invest some time learning (read *playing with*) Photo Soap, you'll fall in love. A bargain at \$45.

Quarterdeck's CleanSweep Deluxe widens its lead in the uninstaller league and is a no-brainer upgrade or first-time buy. If you use Windows 95 without an uninstaller, you flirt with disaster every time you dump a program that didn't live up to expectations, or that you've outgrown. Why take the chance? For 40 bucks? C'mon.

Adaptec's new \$90 Easy CD Creator Deluxe Edition finally reaches the levels of ease, convenience, and certainty we've been promised throughout the CD-R era. If you have one of the newer DirectCD CD-R drives, it also makes adding successive chunks of files to a disk over time about as easy as copying the files to a Zip disk.

Dragon's \$200 NaturallySpeaking, the first generally available voice recognition software that lets you speak continuously, not word by tedious word, has gotten great press—all well deserved. I use and rely on NaturallySpeaking. I expect to see a killer voice recognition product from Microsoft in about a year or a year and a half—perhaps embedded in the next major release of Word—but until then, Dragon's likely to hold onto its big lead in voice recognition.

Caere's new OmniPage 8.0 demonstrates why incremental improvements in software—remember that "evolutionary year" tag?—are so important. With Version 8.0, Caere not only maintains its lead over Xerox TextBridge and its other remaining competition but widens the gap, logging the best accuracy scores I've ever recorded. Caere got the interface right in Version 7.0 last year; in 1997 it



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JIM SEYMOUR

focused on the recognition engine's accuracy, with stunning results.

OCR has finally decisively crossed the "better than just retyping it yourself" line. You can upgrade for about \$125; it's hard to imagine a sentient being without *something* on the shelf that qualifies for that upgrade price.

What about kids' software? This has been a great year for new educational and entertainment software. Humongous added luster to its reputation for the best kids' software on the planet (Freddi Fish, Putt-Putt, Pajama Sam) with the first title in its new Spy Fox series (\$30), Big Thinkers for kindergartners and first graders (\$20), and the incredible Backyard Baseball (\$30). Backyard has levels of complexity and intelligence I've simply never seen in kids' software. Not only do you get many playing fields, lots of game variety and strategy, and that wonderful Humongous artwork, you also get a hip, ethnically rich cast of kids. Someone at Humongous understands the importance of diversity in our society, and it shows in Backyard Baseball.

Humongous games consistently offer more fun and longer playability than other publishers' titles. As a parent of a 6-year-old computer buff, I can tell you that springing for \$30 to \$40 for a package that Graham absorbs and walks away from after a couple of hours is immensely frustrating. *No one* burns out on Humongous games—especially rich and complex ones like Spy Fox and Backyard Baseball—in 2 hours. Or 20 hours.

Look, too, for great CDs from an unexpected source: the Discovery Channel. Discovery Channel's Invention Studio and Nile: Passage to Egypt (both \$30 to \$40) are favorites at our house. If you can't find them easily, call Discovery at 800-889-9950 or go to its Web site (shopping.discovery.com).

Take a look at Encarta 98 Deluxe (\$80) and Britannica CD 98 (\$100) in the encyclopedia market, and maybe the new Compton's Interactive Encyclopedia 98 (\$65) and World Book Multimedia Encyclopedia 1998 (\$70), too.

If you want the ultimate contact manager, look at GoldMine 3.2 (\$99). For the smartest desktop publishing package, get Design Intelligence's *i publish* 2.0 (\$99). For the best-ever way of exchanging fully formatted documents with others, get the new 3.0.1 release of Adobe Acrobat (\$175). Your colleagues can use the free Acrobat Reader to view your Acrobat creations on virtually any computer.

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DOESN'T TRANSLATE INTO FINNISH.**

The Way It Wasn't

At the time, it seemed like a good idea, and that's how I wrote it back in 1983: Vendors were going to build infrared transceivers into every portable PC, printer, and desktop PC, and as IR became universal, users would effortlessly, wirelessly transfer files and print

out their documents. The reality turned out to be a bit less spectacular. Many notebooks today have IR, but almost no PCs or printers do; and for every person who uses IR, there are probably ten who don't, or who hate the conflicts introduced by one more I/O device in a computer environment that allows only 16 interrupts. Infrared never became universal.

I've now written five years' worth of columns for *PC Magazine*. In the computer industry, that's enough time to discover how often your predictions turn out to be just plain wrong.

Looking back, I see how easy it was for a reviewer to be seduced by almost-shipping products that promised to make computing faster, cheaper, and simpler. Although you're supposed to be an impartial observer, a part of you really *wants* the products to work. And when Intel and Microsoft are behind the products, you figure: How could they miss? I now believe as gospel what John C. Dvorak has been saying for a decade: that Microsoft starts to get it right somewhere around Version 3. And it took a while to get to Version 3.

Half a dozen times, I've written about the Universal Serial Bus, the Intel/Microsoft-supported, once-and-future 12-Mbps bus that promises to replace parallel, serial, mouse, keyboard, joystick, and maybe scanner cables with a single, daisy-chained connector. In 1995 I said you'd see USB PCs in 1996. Hah! It won't be until the second half of 1998 that the PC hardware *and* the operating system *and* the USB peripherals will be in place. In this case, it's taking not three versions but three years to happen. Moral of the story: Believe it when you see it.

Ease of use has been a favorite column topic of mine. Many of the things I've written about—actually, complained about—still haven't been addressed by hardware and software vendors. Examples of these are PC connectors, buttons, and switches labeled in hieroglyphic symbols rather than plain English, or PC Card notebook modems, which are used instead of integrated modems, and their easily lost dongles.

I've often thought that we were one or two breakthroughs away from the PC we really wanted. In 1995, it seemed as if Windows 95, PCI cards, and Plug and Play were going to make PC configuration a breeze. Two things

kept that from happening: Plug and Play worked most of the time, not *all* of the time; and Plug and Play couldn't get around the fact that while PCs have 16 interrupts, the needs of your PC and all your accessory cards add up to 20-plus interrupts. Turns out we won't get past the interrupt hassles until late 1998 or 1999, when PC makers do away with ISA cards at the behest of the Microsoft PC 98 specification.

Which of my predictions landed farthest from the bull's-eye on the dart board? Back in 1993, I thought that Intel would wind up sharing the CPU market with Digital Alpha, HP PA-RISC, MIPS R4000/R4400, Motorola's Power PC, and x86-compatible CPU makers AMD, Cyrix, and IBM. I also thought that users wouldn't much care which CPU they used as long as it ran a common operating system on top. Wrong!

As far as predictions or recommendations that proved themselves over time, the one that seems most solid is my advice about buying PCs. The best deal, I have always believed, is to buy near the top of the food chain—typically one or at most two levels down from the top—where you get the best combination of

performance, value, and system longevity.

Two and a half years ago, for instance, when the top CPU was a 133-MHz Pentium, the smart buy for \$2,500 was a 90-MHz or 100-MHz Pentium system with 16MB of RAM. Bargain hunters could have gotten a Pentium/60 or Pentium/66 system with 8MB RAM for about \$1,500 then. Though the latter configuration would feel slow today compared with the current Pentium II CPUs, the then-top-of-the-line Pentium/133 would still be usable. That's why I'm worried about the success of \$1,000 PCs this fall. The price is right on these systems, but they're not going to look like such good deals in another two and a half years. That's the year-2000 problem I worry about. **PE**



TRIED AND TRUE
The prediction
that's proved
itself over time
is my advice
about buying
PCs.

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[†]Amount of monthly lease payment, based upon 24-month lease from Dell Financial Services L.P., an independent entity; first and last monthly lease payments due prior to delivery: \$303, \$258, \$244, \$178. Above monthly lease payments exclude tax which may vary (for example, Hartford City, IN sales tax \$7.57); shipping cost and \$95 doc. fee due with second payment; no security deposit required; subject to credit approval and availability. Lease terms subject to change. ^{**}Some conditions apply.

technical excellence awards

BY
MICHAEL J.
MILLER

technical Excellence. It sounds simple, but in the world of ever-changing technology, it's sometimes hard to find. Every year, we see and use countless new products, yet real innovation is rare. Many of the products we use every day are very good but stand only a few evolutionary steps ahead of what we used a year ago.

For our 14th annual awards for technical excellence, we looked for real breakthroughs in the way we use personal computers. We found such excellence in a number of PCs that went far beyond the ordinary and in new components and peripherals that promise even further advances in coming years. We were impressed with software designed to improve the ways we work and play, as well as by new standards that

promise to bring higher levels of technology to fields as diverse as entertainment and network infrastructure.

A team of *PC Magazine* editors, senior contributors, and PC Labs personnel spent months debating the merits and drawbacks of the thousands of new products, via a special

Lotus Notes/Domino discussion database developed by Internoded Inc., a consulting firm specializing in Lotus Notes/Domino, Internet, and multimedia applications (www.internode.com, 617-876-4007).

To be eligible, products had to ship during the period from October 1, 1996, to September 30, 1997.

Of course, there are many other mature, significant, and worthy products, and we'll be highlighting some of them in "The Best of 1997" in our next issue.



Development Tools • After Hours • Persons of the Year • Lifetime Achievement

Of the hundreds of products and technologies developed each year, only a select few give us a glimpse into the future of computing. PC Magazine honors those that embody true technical excellence and inspire us as we move forward.

nce



Winner: IBM ThinkPad 770

ADALIO SANCHEZ, YUICHI SHIRAISHI, YUKIHIKO HIRANO, HIROAKI AGATA, YOSHIHISA ISHIHARA, KAZUMI ITOH, ATSUSHI KUMAKI, TOMOKI MARUICHI, KANEYASU IBAYASHI, SHUN UNO, YOICHI HIROSE

Equipped with Intel's newest mobile chip, code-named Tillamook, the IBM ThinkPad 770 is the ultimate notebook available today.

Although the system is roughly the same weight as the previous series' model, the ThinkPad 770 incorporates a wish list of features not found in any other portable system. These include the largest notebook display on the market, the highest-capacity hard disk available, the first DVD-ROM drive, the most versatile and convenient modular bay, and an enhanced version of IBM's peerless TrackPoint technology.

In a high-end market where screens typically measure 13.3-inches across diagonally and hard disks top out at 3GB, the ThinkPad 770 offers both a 14.1-inch display and a 5.1GB hard disk. The disk fits into the ThinkPad's unique, modular UltraBay. Unlike earlier modular bay designs, the UltraBay takes the guesswork out of component hot-swapping. It is equipped to house either a 20X CD-ROM drive, an additional 5.1GB hard disk, a second lithium ion battery, a standard floppy disk drive, or a DVD drive. Various indicator lights on the bay

let users know exactly when they can safely swap components.

With the ThinkPad 770, IBM has also significantly improved its TrackPoint pointing technology. TrackPoint is the only mouse surrogate that integrates into a system's keyboard. Its unique Press-and-Select feature lets you tap once on the TrackPoint to mimic either a left or right mouse click, which means you don't need to

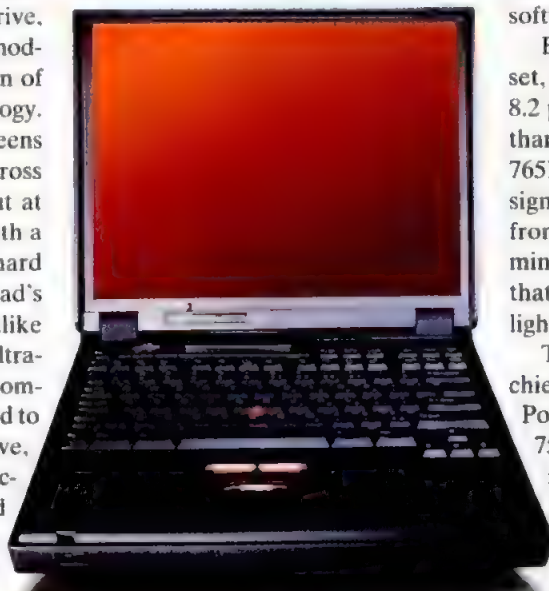
move your hands off the keyboard when launching programs or accessing menu commands.

An additional button at the base of the keyboard lets you scroll up, down, left, or right through a document without having to use Windows' on-screen scroll bars. The same button also lets you magnify a selected rectangle of screen for close-up viewing, a feature that is typically implemented only via software.

Even with this remarkable feature set, the weight of the ThinkPad 770 is 8.2 pounds—only 0.4 pounds heavier than its predecessor, the ThinkPad 765D. IBM has cleverly pruned off a significant amount of plastic from the front of the machine and drilled minute holes into the metal casings that surround its major disk drives to lighten the load.

The notebook is no heavier than its chief competitors, the Micron Transport XKE and the Toshiba Tecra 750CDT, despite being several technological steps ahead.

IBM PC Corp., Research Triangle Park, NC; 800-426-2968; www.pc.ibm.com/thinkpad.



HP Kayak XA

CHRISTINE BILLARD, CATHERINE GUILLOT, VINCENT HECTOR, MALAYA LANE, JEAN-CHRISTOPHE PAUTRAY, FREDERIC VU, DIDIER PLANE

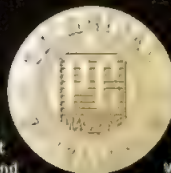
For more than a year, the industry's leading manufacturers have extolled the manageability and serviceability of their corporate PCs. Yet a true managed PC, a machine that lets an administrator inventory and monitor internal components and monitor critical hardware, had not existed—until the debut of the HP Kayak XA. The unit and its integrated Desktop Management Interface (DMI) solution, TopTools, are prototypes for the future of the managed PC.

Running TopTools from a remote console lets you inventory any Kayak's bus slots, major subsystems, and I/O ports. You can monitor temperatures, voltages, and fan speeds. TopTools also gives you the power to take active control of various hardware features, as well as power the unit on, update the BIOS, lock the mouse and keyboard, or disable disk drives.

Even the physical architecture of the Kayak is thoughtfully designed for easy serviceability. The lockable chassis is tool-free; by removing the power supply, you gain access to key motherboard components.

Once machines like the Kayak gain wide acceptance, corporate LAN management will become much less burdensome.

Hewlett-Packard Co., Palo Alto, CA; 800-322-4772; www.hp.com.



Micron Powerdigm XSU Workstation

MICRON POWERDIGM DEVELOPMENT TEAM, LED BY JEFF MOESER AND DEAN KLEIN

The Micron Powerdigm XSU Workstation represents a breakthrough in PC performance. The XSU is the first Pentium II-based system to use the Samurai LXI—Micron's own chip set—which features an innovative bus structure designed to increase the PC's system bandwidth. This increase results in a marked boost in speed over Intel's 440FX and 440LX chip sets, which drive all other Pentium II workstations.

While most Wintel systems are built with a single PCI bus equipped with four separate slots running at 33 MHz, the XSU's chip set allows for a second PCI bus, whose 64-bit slot operates at 66 MHz. This secondary bus not only allows peripherals to operate at much faster speeds, but it also frees up considerable space on the primary PCI bus. With the Samurai's peer-level bus structure, data is not funneled through the primary bus to reach the secondary bus.

This configuration has exhibited market-leading performance. By using a graphics card in this 66-MHz slot, the Powerdigm has more room on its main bus for all other system operations. This helped to vault the Powerdigm XSU to its top spot in our recent roundup of 300-MHz Pentium II workstations.

We commend Micron not only for designing and implementing its own chip set but for developing an inventive and effective one.

Micron Electronics Inc., Nampa, ID; 800-776-4518; www.micronpc.com.

Finalists:

Cyrix MediaGX Processor

MEDIAGX DEVELOPMENT TEAM

The Cyrix MediaGX Processor is much more than a processor. It is the first x86-capable chip to integrate a graphics accelerator, an audio subsystem, a PCI interface, and a memory controller into a single core technology. The chip's unprecedented architecture, which can significantly reduce PC manufacturing costs, helped spawn an entirely new genre: the sub-\$1,000 PC.

Not only is the chip itself inexpensive, but it also eliminates the need for several ancillary hardware components. Since the MediaGX contains a graphics accelerator and an audio subsystem, the need for separate graphics and audio cards is eliminated. **Cyrix Corp., Richardson, TX; 800-462-9749; www.cyrix.com.**

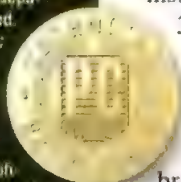
3Dfx Voodoo Rush

VOODOO RUSH DEVELOPMENT TEAM

3-D continues to get all the buzz in the graphics arena. For the past couple of years, chip makers have regularly one-upped each other with improved 3-D acceleration and more true-to-life 3-D effects. But with its Voodoo Rush chip, 3Dfx raised the bar for real-time 3-D rendering on the PC.

Voodoo Rush was the first chip to implement nearly every texturing and lighting mode available under any 3-D API, leaving other first-generation mainstream chip sets in the dust. Features such as specular highlighting and linear per-pixel MIP mapping, as well as the ability to blend pixels for texture compositing, make this chip a marvel.

3Dfx Interactive, San Jose, CA; 408-935-4400; www.3dfx.com.

**Winner: Intel MMX Technology**

THE MMX DEVELOPMENT TEAM

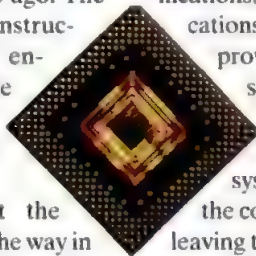
MMX Technology, which debuted in January in the Pentium Processor with MMX Technology, marked the first major change to Intel Corp.'s x86 instruction set since the advent of the 386 chip over a decade ago. The 57 new processing instructions, designed to enhance and accelerate multimedia, have breathed new life into the CPU and PC markets.

Intel's triumph is not the instructions themselves but the way in which they were introduced.

The company was able to coordinate the release of third-party software custom-coded to take advantage of MMX to coincide with the release of the Pentium Processor with MMX Technology. Al-

though MMX chips are augmented with a set of entirely new instructions, they are compatible with all extant x86 software. Applications specifically coded to use MMX—typically audio, video, communications, and image-processing applications—exhibit remarkable improvements in both quality and speed. Since most MMX applications were games and education titles at first, MMX systems quickly found a home in the consumer and SOHO markets, leaving the Pentium Pro to the corporate environment. MMX has seized most of the processor market in less than six months, making the non-MMX chip seem almost antediluvian.

Intel Corp., Santa Clara, CA; 800-628-8686; www.intel.com.



PERIPHERALS

Winner: Epson Micro Piezo

JAY SHEARS AND THE MICRO PIEZO DEVELOPMENT TEAM

Ink jet printing for the office and home is improving by leaps and bounds, driven by technology advancements such as Epson's Micro Piezo printing technology.

Micro Piezo print-heads are designed to lay

down smaller, sharper, rounder dots than those created by thermal print-heads, with less overspray and fewer stray dots.

The precise control Micro Piezo enables also allowed Epson engineers to push print resolution to an industry-



The Micro Piezo print head allows unmatched 1,440-dpi resolution.

leading 1,440 dpi. These attributes, combined with other advancements such as AccuPhoto halftoning algorithms and quick-dry inks, help Epson's Stylus ink jet family produce arguably the best output of any printers in their class. The end result: stunning color output that approaches true photo quality, all from printers that cost as little as \$269.

Epson America Inc., Torrance, CA; 800-463-7766; www.epson.com.



Finalists:

VideoDirector Studio 200

VIDEODIRECTOR STUDIO 200 DEVELOPMENT TEAM

If you're a home or small business user who has considered doing your own video editing but are put off by the cost and complexity, Pinnacle Systems' VideoDirector Studio 200 is for you.

Input is from any video camera; output is to any VCR. Inside the unit, the "black box" (actually purple) connected to the parallel port is Pinnacle's proprietary ASIC, which recognizes scene changes and sends a thumbnail of the opening frame and its length to a storyboard editor on your PC. Decide which scenes you want, choose transitions between scenes, add titles with the built-in titler, and click on Make Tape.

Pinnacle Systems Inc., Mountain View, CA; 888-484-3366; www.videodirector.com

Rolodex Electronics REX PC Companion

STARFISH, CITIZEN, AND FRANKLIN REX DEVELOPMENT TEAM

When you split your time between your office PC and a laptop on the road, your PIM is rarely in sync between the two. The innovative REX PC Companion is a clever hardware/software solution.

Simply use the REX TrueSync information software to import and export organizer data from your PC into the credit card-size Type II PC Card device. On the road, access your memo pad, address book, and scheduler via the REX's PC Companion nine-line LCD screen—the first ever incorporated into a PC Card. **Franklin Electronic Publishers Inc., Burlington, NJ; 888-739-6400; www.franklin.com/rex.**



SOFTWARE

Winner: NaturallySpeaking

NATURALLYSPEAKING RESEARCH AND DEVELOPMENT TEAM

Finally—an accurate product for continuous speech recognition that facilitates dictation on your PC! With Dragon Systems' NaturallySpeaking, Version 1.0, you talk into a microphone in a natural manner and the program records your words on the screen, achieving impressive accuracy in the process.

At the press announcement last April, Dragon claimed users would be able to talk to their PCs as if they were talking to neighbors. The results may not be quite that good (see editor-in-chief Michael J. Miller's humorous results in "I. Want. To. Talk. To. You.," September 23, 1997). Nevertheless, NaturallySpeaking is clearly a major breakthrough in speech technology, which is by all accounts one of the most compelling areas of growth for PCs in the coming months and years.

Previously, all so-called general-purpose speech recognition products relied on discrete speech. You... had...to...talk...like...this (with distinct

pauses between words) to get the software to recognize what you were saying. Other companies focused on general-purpose products for continuous speech recognition—but Dragon brought its product to market first, in



June. It was followed closely by IBM's ViaVoice, and Lernout & Hauspie, which now owns Kurzweil, is promising a similar product by the end of the year.

NaturallySpeaking includes a healthy active vocabulary of 30,000 words, which covers most of the words we use daily. It also includes a

230,000-word dictionary, so that you can easily retrieve less common words. You add new words with Dragon's Vocabulary Builder, which searches the documents on your hard disk for words you use more frequently, or by simply saying a new word and spelling it once. When you do need to spell words, you simply pronounce each letter. Other products have required you to use different approaches for inputting letters, such as the military's *alpha, bravo, Charlie* scheme. To train NaturallySpeaking initially, you simply read an 18-minute passage from Dave Barry's *Dave Barry in Cyberspace*.

We're also finally seeing some realistic expectations for the type of system you need to perform continuous speech recognition on this scale. The requirements for NaturallySpeaking are a Pentium/133 with 32MB RAM on Windows 95 (48MB on Windows NT), an industry-standard 16-bit sound card, and 60MB hard disk space. Dragon Systems includes a high-quality headset with microphone right in the box.

Dragon Systems Inc., Newton, MA; 800-437-2466; www.naturalspeech.com.

i publish 1.0

DESIGN INTELLIGENCE DEVELOPMENT TEAM

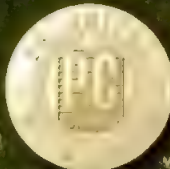
With *i publish 1.0*, Design Intelligence takes desktop publishing—always one of the more popular tasks for PCs—to a new level of accessibility. With its drag-and-drop scheme, *i publish* makes it easier than ever to turn your text and artwork into professionally designed print or Web pages.

Users select the design and the content that go into the piece they're creating and *i publish* handles the rest. No sizing of fonts or photos, no designating spacing—*i publish* does it all. And *i publish* proves particularly useful in this Web age: It lets you take any print document and repurpose it to a format you can use on the Web with a single click of the mouse.

With *i publish 1.0*, Design Intelligence gives well-intentioned users of desktop publishing an upper hand on page design, something many have desired (or needed) for years. The product automatically does all the work behind the scenes with its SmartPage technology, creating a variety of print documents, screen-based presentations, and Web pages.

Design Intelligence claims *i publish* was the first desktop publishing application to embed a browser (Internet Explorer 3.01), and all of the document creation is done within this browser. Version 2.0 debuted recently and supports IE 3.02, look for an IE 4-supported version by early next year.

Design Intelligence Inc., Seattle; 668-276-2547; www.design-intelligence.com.

**Oracle8**

THE ORACLE8 DEVELOPMENT TEAM

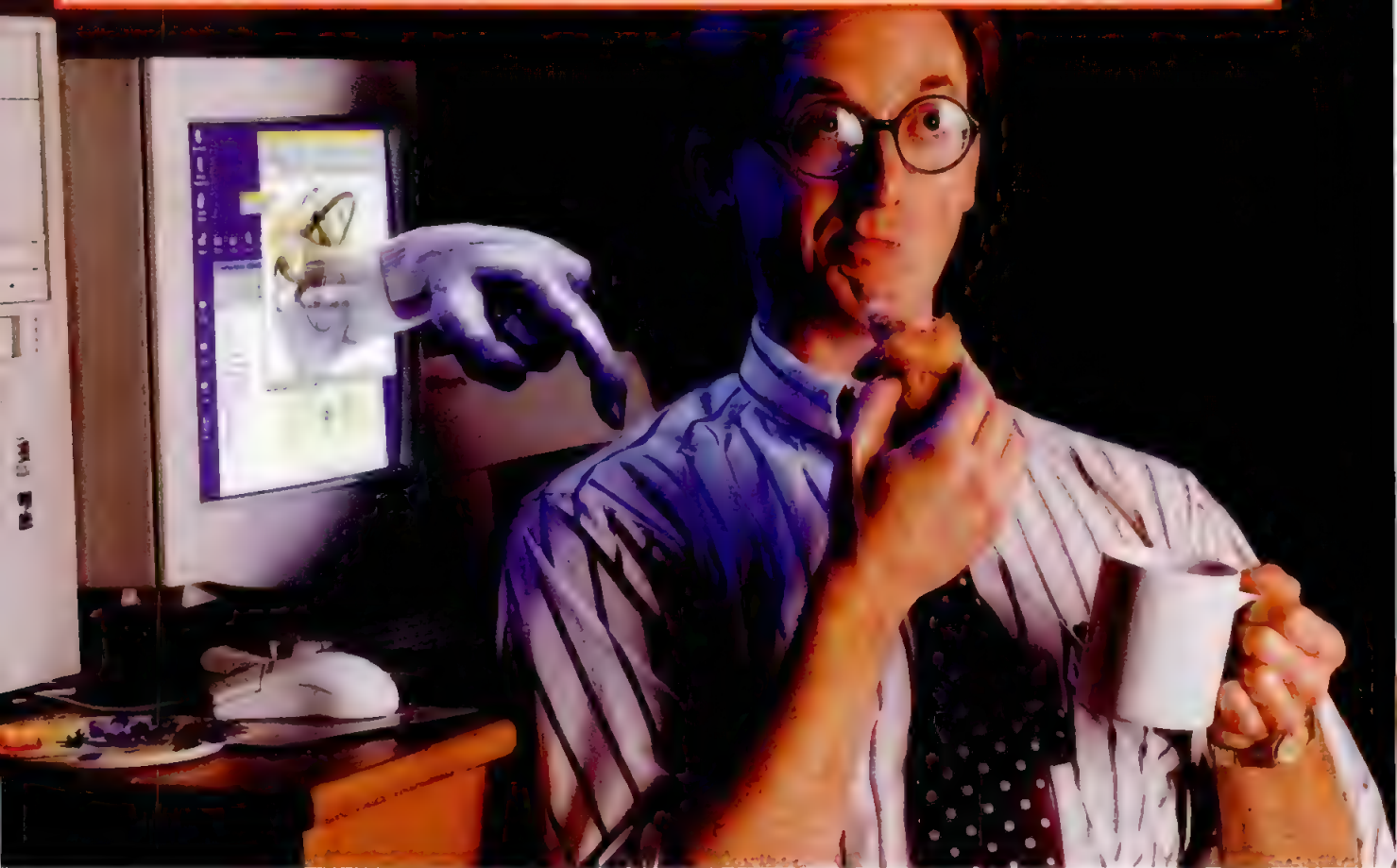
Long a dominant player in the relational database market, Oracle Corp. topped the ante even higher for an enterprise-wide application built on database servers with the latest version of its venerable SQL database software. Oracle8 was four years in the making, but the results show the wait was worthwhile.

Oracle8 Universal Data Server is currently available for Windows NT and Solaris, as well as a host of other Unix platforms. It includes some major advancements that deliver the manageability, scalability, and performance required for online transaction processing and data warehousing, two major trends in PC computing. Oracle8 is also the cornerstone of Oracle's Network Computing Architecture—with thin clients served by universal data servers.

A significant new feature in Oracle8 is the ability to partition tables across multiple disk devices. Other new features include connection pooling, which lets the system manage large numbers of client connections efficiently, and connection multiplexing, which lets Oracle off-load most connection management to a separate server with a single, fast connection to the database. The latter feature helps minimize network traffic to the database server. New database support for object references—fast table pointers that replace relational joins—yields major performance improvements.

Oracle Corp., Redwood Shores, CA; 415-556-7000; www.oracle.com.

Wouldn't it be great to have a full-time
tech expert in your PC, alerting you to
possible problems before they happen?
(Comforting thought, isn't it?)



Quantex has always built its machines to last, and backed them up with award winning tech support, second to none. Now, working hand in hand with Intel and utilizing their LANdesk® Client Manager Technology (LDCM), we've taken "support" to new heights. LDCM, a technology designed to monitor your PC's health and provide early warnings of potential PC problems, was originally developed for large businesses. Quantex now makes this technology available in a user-friendly format for individual and small business users.

LDCM automatically loads each time your PC is turned on, and runs in the background while you work. It continuously checks on the condition of your computer, and sends you a visual warning upon recognizing potential problems. A simple click of the mouse will inform you of a number of possible solutions to consider. If additional assistance is required, a system analysis print out can be sent to a Quantex technician to facilitate a quick resolution.

By catching a problem before it becomes a problem, there's no costly downtime. No lost productivity. And no worries. Which is the way it usually is with Quantex PC's. Only now, even more so.



It's great to know Quantex

The competition can't measure up to our award-winning systems.

Recently, our multimedia systems were awarded some of the industry's highest honors by *PC World* (11/97). Our QP5/200 SM-1 won praise as a "Best Buy", and was bestowed the number three spot in the Budget Desktop category. And, in the the Power Desktop category, our featured system, the QP6/266 SM-4x, achieved an honorable number six ranking. No surprise - it combines the biggest picture (19" Digital Monitor), the fastest CPU (300MHz Pentium® II processor), the largest hard drive (8.4GB EIDE), and the most stunning graphics available (128-bit Riva 128 3D AGP Card), all for less than you'd ever thought possible.



QP6/300 SM-4x **\$2999**

(featuring Pentium® II processor)

Business lease: \$105/Mo.

- 300MHz Pentium® II Processor
 - Intel 440LX PCI Chipset
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 - 8.4GB EIDE Mode 4 HD / 3.5" 1.44MB Floppy Drive
 - 128-bit Riva 128 3D AGP Graphics Card with 4MB SGRAM
 - Upgrade to AGP Matrox Millennium II 3D w/8MB WRAM for only \$149
 - 19" Digital Monitor (18.1" viewable)
 - Altec Lansing ACS-45 Speakers w/subwoofer
 - Includes all Standard Features
 - Quantex PC Health Monitoring & Support based on LDCM
- QP6/233 SM-4x (featuring Pentium® II processor) **\$2699**
 QP6/266 SM-4x (featuring Pentium® II processor) **\$2799**

QP6/300 SM-4x SE **\$3199**

(featuring Pentium® II processor)

Business lease: \$104/Mo.

- 300MHz Pentium® II Processor
 - Intel 440LX PCI Chipset
 - 64MB SDRAM Memory / 512KB Secondary Cache
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 - 128-bit Riva 128 3D AGP Graphics Card with 4MB SGRAM
 - 19" Digital Monitor (18.1" viewable)
 - Toshiba 2nd-Generation DVD-ROM Drive
 - DVD Decoder Board
 - Altec Lansing ACS-490 Speakers w/subwoofer
 - Includes all Standard Features
 - Quantex PC Health Monitoring & Support based on LDCM
- QP6/233 SM-4x SE (featuring Pentium® II processor) **\$2899**
 QP6/266 SM-4x SE (featuring Pentium® II processor) **\$2999**

Standard Features

- 2 Universal Serial Bus (USB) Ports
- K56flex™ protocol Fax/Modem w/Voice Mail and Speakerphone
- 24X Max EIDE CD-ROM Drive
- Ensoniq 32-Bit Wavetable Sound Card
- 104-Key Keyboard With MS IntelliMouse
- MS Windows '95 With MS Plus
- Power Multimedia Software Bundle (Including MS Office '97 SBE)
- 3-year limited warranty, 24-hr./7-day Technical Support
- Quantex Tower Case

Power Multimedia Series

QP5/233 SM-1 **\$1599**

(with MMX™ Technology)

Business lease: \$56/Mo.

- 233MHz Pentium® Processor with MMX™ Technology
 - 32MB EDO Memory / 512KB Pipeline Burst Cache
 - 3.2GB EIDE Mode 4 HD / 3.5" 1.44MB Floppy Drive
 - STB Nitro 3D with 4MB
 - 15" Digital Monitor (14.0" viewable)
 - Altec Lansing ACS-90 Speakers
 - Quantex PC Health Monitoring & Support based on LDCM
- QP5/200 SM-1 (with MMX™ Technology) . . . **\$1499**
 QP6/233 SM-1x (featuring Pentium® II processor) **\$1799**
 QP6/266 SM-1x (featuring Pentium® II processor) **\$1899**

QP6/233 SM-2x **\$2049**

(featuring Pentium® II processor)

Business lease: \$72/Mo.

- 233MHz Pentium® II Processor
 - 32MB EDO Memory / 512KB Secondary Cache
 - 4.3GB EIDE Mode 4 HD / 3.5" 1.44MB Floppy Drive
 - STB Nitro 3D with 4MB
 - 17" Digital Monitor (16.1" viewable)
 - Altec Lansing ACS-90 Speakers
 - Quantex PC Health Monitoring & Support based on LDCM
 - Upgrade SM-2 to 64MB EDO RAM and 5.1GB HD for only \$150
- QP5/200 SM-2 (with MMX™ Technology) . . . **\$1749**
 QP5/233 SM-2 (with MMX™ Technology) . . . **\$1849**
 QP6/266 SM-2x (featuring Pentium® II processor) **\$2149**

QP6/266 SM-3x **\$2349**

(featuring Pentium® II processor)

Business lease: \$82/Mo.

- 266MHz Pentium® II Processor
 - Intel 440LX PCI Chipset
 - 32MB SDRAM Memory / 512KB Secondary Cache
 - 6.4GB EIDE Mode 4 HD / 3.5" 1.44MB Floppy Drive
 - 128-bit Riva 128 3D AGP Graphics Card with 4MB SGRAM
 - Upgrade to AGP Millennium II 3D w/4MB WRAM for only \$49
 - 17" Digital Monitor (16.1" viewable)
 - Altec Lansing ACS-45 Speakers w/subwoofer
 - Quantex PC Health Monitoring & Support based on LDCM
- QP6/233 SM-3x (featuring Pentium® II processor) **\$2199**
 QP6/300 SM-3x (featuring Pentium® II processor) **\$2549**

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- MS Office '97 SBE
- MS Money '97
- Office Mate
- Day Planner Pro
- Power Business Plans
- Form Designer Pro
- Project Manager Pro
- Labels Unlimited
- Compton's Reference Collection
- Dr. Solomons Anti-Virus
- Windows 95 with MS Plus
- One-month trial memberships to AOL, CompuServe and Prodigy

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- Panasonic PD/CD-Rom Drive w/ one 650MB PD cartridge \$ 249
- Microsoft Natural Keyboard (upgrade from 104-keyboard) \$ 39
- HP Deskjet 692C Printer (w/photo color kit) \$ 299

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The notebook that has absolutely everything
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Windows Sources "Power User's Bargain" (11/97)

"All in all, Quantex's H-Series is an excellent entry into the power-user segment of the notebook market...it offers the best deal we've seen on a 13.3-inch XGA screen."

PC Magazine "Honorable Mention" (10/07/97)

"...a great choice if you want a 233MHz (Pentium® processor with MMX™ technology) notebook but don't want to break the bank in the process"

C-Net Snapshot "Buy It" (09/17/97)

"Quantex makes an impressive debut in the laptop market with a value-priced portable that offers great features and performance."
"...users should definitely give the Quantex H-Series 1330 and the value it offers a serious look. We did, and that's why it gets a Buy It."



Quantex H 1331 \$4299

Business lease: \$140/Mo.

- 233MHz Pentium® Processor with MMX™ Technology
- Intel Mobile Module (I.M.M.) Architecture
- 13.3" XGA Active Matrix Display
- 64MB SDRAM (expandable to 144MB) / 512KB Pipelined Burst Cache
- 4GB HD / 3.5" 1.44MB Modular Floppy Drive
- PCMCIA K56flex™ protocol Fax/Modem
- 20X Max Modular CD-ROM Drive
- PCI Bus with 128-bit graphics accelerator
- Integrated 16-bit Stereo Sound and Speakers
- Smart Lithium Ion Battery
- USB and Fast IR Ports
- Integrated Personal Touchpad
- MS Windows '95
- MS Office '97 SBE
- Carrying Case
- 24-hr./7-day Technical Support
- 3-year limited warranty on CPU and Main Memory
- 1-year parts and labor limited warranty on all other components



Quantex H-Series Notebooks do not include LDCM support

Quantex H Series

Standard Features ■ 3.5" 1.44 Modular Floppy Drive

- 20X Max Modular CD-ROM Drive ■ PCI Bus w/128-bit graphics accelerator
- Integrated 16-bit Stereo Sound and Speakers ■ Touchpad
- Smart Lithium Ion Battery ■ USB and Fast IR Ports

Quantex H 1211 \$3299

Business lease: \$107/Mo.

- 233MHz Pentium® Processor with MMX™ Technology
- Intel Mobile Module (I.M.M.) Architecture
- 12.1" SVGA Active Matrix Display
- 32MB SDRAM (expandable to 144MB)/512KB Pipelined Burst Cache
- 2GB HD
- PCMCIA K56flex protocol Fax/Modem
- Windows 95
- Carrying Case

SUPPORT POLICY

- 30-day money back guarantee ■ One-year Parts and Labor limited warranty ■ 3 years limited warranty on CPU and Main Memory ■ 1-year Depot Repair ■ 1-year express Replacement limited warranty ■ 24-hr./7-day Toll Free Technical Support

OPTIONS ■ Mini-Docking Station...\$199 ■ 2nd Lithium Ion Battery...\$199 ■ PCMCIA Network Adapter...\$129

■ Deluxe Carrying Case...\$99

Quantex H 1330 \$3899

Business lease: \$127/Mo.

- 233MHz Pentium® Processor with MMX™ Technology
- Intel Mobile Module (I.M.M.) Architecture
- 13.3" XGA Active Matrix Display
- 32MB SDRAM (expandable to 144MB)/512KB Pipelined Burst Cache
- 3GB HD
- PCMCIA K56flex protocol Fax/Modem
- Windows 95
- Carrying Case



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INTERNET

Winner: JavaBeans

THE JAVA BEANS DEVELOPMENT TEAM

With the advent of the JavaBeans component standard, Sun Microsystems is finally able to shed Java's image as a toyware applet generator. The power and versatility of JavaBeans presents a good alternative to Microsoft's ActiveX for building business applications for the Web.

JavaBeans lets you share and reuse components easily and deploy

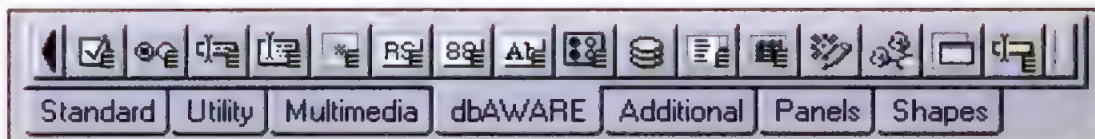
Java-based components in new ways not possible before. This will accelerate Java development dramatically, letting developers get past the basics quickly and concentrate on advanced applications.

Keeping it simple was the guiding principle behind JavaBeans and is one of its most impressive strengths. Unlike what you find in ActiveX technology, Sun Microsystems designed JavaBeans to be used for components, making it easy for vendors to build beans that can be reused in many Java development tools. Telling the world about what properties, methods, are

and events in JavaBeans is generally easier than with other component models because this information is built right into the control, and not separate (as with type library information in Microsoft ActiveX Controls, for example).

through because of its simplicity.

The JavaBeans component model includes a slew of additional features. These include the ability to archive, download, and execute JavaBeans remotely, as well as the ability to save and restore data—referred to as *per-*



JavaBeans, the Internet's answer to component-based development, allows users to encapsulate a wide range of functionality into reusable, easily distributed objects that can be used in other programs or stand alone on Web pages.

There are two approaches to building JavaBeans: You can publish what a JavaBean can do simply by conforming to certain naming conventions, or you can employ a more advanced method involving descriptor classes, which describe what properties, methods, and events a bean can offer explicitly by filling classes with this information. Either approach will result in an easily reusable JavaBean: A tool or application checks a bean's contents, then can instantly add it to a development environment or application by reading its methods and properties. This is a break-

sistence. The JAR file specification lets you download beans to a Web page, then install and run them inside your browser.

Other features include security APIs, which ensure security over the Internet, and Remote Method Invocation (RMI), which lets remote machines invoke beans, thus making distributed computing on Java a possibility. These features, though not exactly new, have never been available in such a platform-independent way as with this new Java standard.

Sun Microsystems Inc., Palo Alto, CA; 650-786-7737; www.sun.com.

Castanet

CASTANET DEVELOPMENT TEAM

An exciting offshoot of the Java development work of Sun Microsystems, Marimba's Castanet technology is a powerful application delivery mechanism that brings push content and software updates to your PC. Castanet stands apart from other push technologies with its intelligent handling of downloads and its ability to cope with a wide range of application types.

The way Castanet is structured offers superior performance and shorter download times. Since Castanet channels are Java applications and not applets, you download only the updated content, not the whole channel. This alleviates performance problems that plague other push solutions. Each application is stored on your hard disk, so channels operate locally without a live Internet connection. Castanet's technology was impressive enough to be incorporated into Netscape's Netcaster, where it provides some of its channel delivery and updates.

Castanet has expanded beyond a Java solution. Its UpdateNow technology lets Castanet deliver software updates not just for Java programs but also for those written in C, C++, and Visual Basic. The ability to distribute a wide spectrum of software in a fast and unobtrusive way makes Castanet the first push product that lives up to some of the hype.

Marimba Inc., Palo Alto, CA; 415-328-5282; www.marimba.com.



Microsoft Internet Explorer 4.0

INTERNET EXPLORER 4.0 TEAM

Considering how quickly the Web has become ubiquitous, it isn't surprising that Microsoft's once-humble browser Internet Explorer has matured into a full Web application suite, complete with the most technically sophisticated features of any browser. IE 4.0 integrates into your desktop, boasts significant leaps in Web navigation, and features the most complete dynamic HTML implementation available.

IE4's most significant achievement is True Web Integration, which lets you add browserlike functionality to your operating system. Windows folders can become minibrowsers, and the IE4 toolbar sits on the desktop, letting you surf your hard disk as well as the Web. The Active Desktop lets you embed all or parts of Web pages onto your desktop, transforming static bitmap wallpaper into a vital resource that primes you with news, stocks, or whatever interests you. By contrast, Netscape Communicator's Webtop limits you to one embedded Web page at a time and cannot integrate your browser with your hard disk.

IE4's implementation of dynamic HTML (DHTML) is much more complete than Communicator's. With it, Web designers can build interactive pages that can have elements scroll to their final position on each page, or allow the placement of the cursor to trigger additional information or some visual effect to appear.

Microsoft Corp., Redmond, WA; 800-426-9400; www.microsoft.com.

Finalists:

“It constantly **amazes** me how Dan,

my account manager at **CDW**, seems to know what's coming in

new **technology**,

new business trends, new products, and next week's episode

”

of The Simpsons.

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Get more than just a great price.

For example, he can turn you on to new product options and technologies that are more efficient or economical. Solve the toughest compatibility questions before they become problems. Even get you the **free tech support** you need before you need it. And, of course, line up the right price for you.

So call us. We'll set you up with your own technological guru. A highly-trained business computer specialist who'll be on the same wavelength you are day after day.

That way, your company will have access to a huge selection of brand-name products. In fact, **CDW is the leading seller of IBM, Compaq, Hewlett-Packard, Toshiba and Microsoft in the direct marketing channel**, and we have their products at the right prices, in stock, ready for overnight delivery, and easy credit. You'll also get someone who can give you some honest, friendly, professional advice that will save you more than money.

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Finalists:

Front Desk

DAVID FRANKLAND, THE FRONT DESK DEVELOPMENT TEAM

Jetstream Communications' Front Desk is the first product we've seen to use ISDN to its full potential. The ISDN phone system acts as an ISDN terminal adapter, PBX, voice mail, and intelligent forwarding system.

Front Desk's most impressive feature is its ability to provide multiple call appearances on a single ISDN line, giving the appearance of a four-to-eight line system. This makes it an excellent solution for SOHO users: One ISDN line begets separate numbers for business, personal, fax, and priority calls—and you get ISDN Internet or remote-office access. **Jetstream Communications Inc., San Jose, CA: 888-538-7873; www.jetstream.com.**

Internet Message Center

INTERNET MESSAGE CENTER DEVELOPMENT TEAM

The Internet Message Center (IMC) solves myriad problems by handling incoming e-mail the same way a telephone call center deals with incoming phone calls. IMC's innovative approach combines the simplicity and open features of Internet POP3 mail with a sophisticated database and client system. IMC automatically assigns a tracking number to each incoming message. At the same time, it e-mails the sender an acknowledgment that includes the assigned tracking number. The original message and all replies can be tracked, providing a useful audit trail.

Mustang Software Inc., Bakersfield, CA: 800-999-9619; www.mustang.com.

Winner: @Home

MILO MEDIN, JONATHAN ROSENBERG, DEAN GILBERT, DAVE BAGSHAW

Local cable companies might appear well poised to deliver Internet access, but the challenge of developing both long-distance connections and local services has been a great stumbling block. @Home overcomes the problem by designing and weaving together a superb back-end system for cable modem service providers. The result is a centralized, end-to-end network management and troubleshooting system that delivers Internet access 100 times as fast as over ISDN lines.

@Home tackles IP addressing, name service, routing, and other functions. In addition to the engineering needed to deploy widespread 155-

Mbps trunks, the designers of @Home practice a philosophy of pushing data closer. Regional cable operators publish local information to create local-market home pages, which are stored on area servers, and local servers cache commonly accessed site information.

Although @Home is available in only a select number of cities at this time, the company is developing techniques such as the delivery of near-CD-quality

audio and broadband video programming and new caching techniques, that are sure to have a big impact on the Internet.

@Home Network, Redwood City, CA: 888-988-9675; www.home.net.



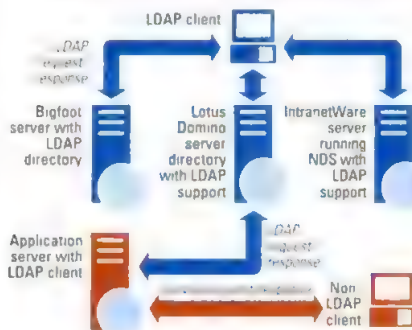
NETWORKING

Winner: LDAP, Version 3.0

TIM HOWES, MARK SMITH, MARK WAHL, AND STEVE KILLE

With the superbly designed LDAP, Version 3.0 (Lightweight Directory Access Protocol), the global directory is one step closer to being a reality. A nimble subset of the comprehensive but unwieldy x.500 Directory Access Protocol (DAP), LDAP has emerged as the premier method for standards-based network directory access.

Today's networks run multiple oper-



ating systems and messaging platforms, each with its own directory of user and resource information. Managing these directories has become one of administrators' biggest headaches, and providing such diverse directory information has been one of the industry's biggest challenges.

LDAP, Version 3.0, describes a directory access system that acts as a common rendezvous point for users, services, and management. Numerous network operating systems, Web browsers, e-mail packages, and other applications have signed onto the standard. While no single company or product deserves all the credit, Tim Howes and Mark Smith have played important roles in LDAP's development since the early nineties.

Internet Engineering Task Force, Reston, VA: 703-620-8990; www.ietf.org.

Finalists:

Synchronicity for NT, Version 1.1

TODD LAWSON, DEAN SCHMIDT, DALE CAVE

The cutting-edge category of the metadirectory lets administrators manage numerous directories from a single source. Unfortunately, today the technology exists more in the form of theoretical papers than genuinely useful products. The exception is NetVision's Synchronicity for NT, Version 1.1.

Synchronicity spans the gap between Windows NT and NetWare. Unlike metadirectories that require the user to learn a new interface and organization, Synchronicity has been developed around Novell's NetWare Directory Services (NDS).

NetVision Inc., Orem, UT: 801-764-0400; www.netvisn.com.

Novell Distributed Print Services (NDPS)

NDPS DEVELOPMENT TEAM

Despite more than a decade of development, printing is often not easy. You lose jobs, hang up printers, and often get sheets of garbage. Poor communication between printers and users and between users themselves leads to problems of misprogramming, overloading, and inefficiency.

The beauty of Novell Distributed Print Services (NDPS) is the number of problems it solves. Any user can manage network print services from a client PC and access information from printers at the client side. Using the NDPS client utility, Novell Printer Manager, you can locate a print job, check its status, and move the job from a busy printer to an available one.

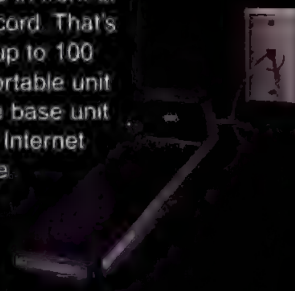
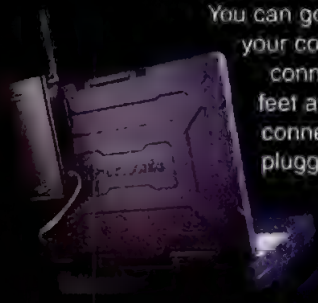
Novell Inc., Provo, UT: 800-453-1287; www.novell.com.



Surf Cordless.

Panasonic introduces the Cordless Data Link.
A cord-free connection for your modem.

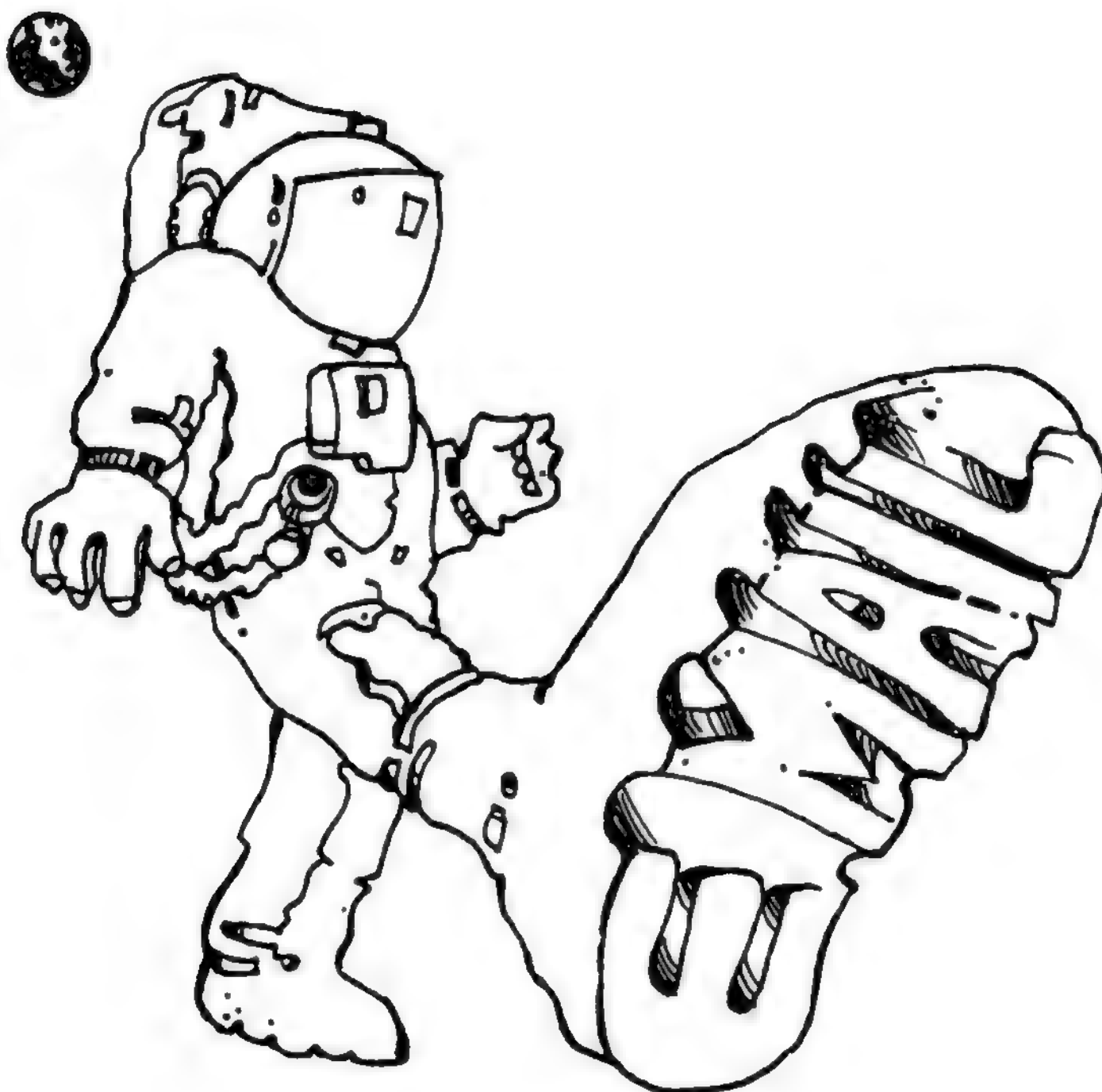
You can go anywhere in the world on the Internet. As long as you're in front of your computer. Connected to a modem. Connected to a phone cord. That's connected to the wall. Well, now you can disconnect and go up to 100 feet away, with the Cordless Data Link from Panasonic. The portable unit connects to your laptop and transmits a 900 MHz signal to the base unit plugged into your phone jack. Up to v.34 (28.8 kbps). So, now Internet users will finally go someplace they never go. Outside.



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Finalists:

Portal S1

BE HERE DEVELOPMENT TEAM

The Portal S1, from Be Here Corp., is a groundbreaking digital camera system that can capture a full 360-degree panoramic image in a single picture. You can then navigate around this "PanImage" with a Web browser or virtual-reality plug-in.

Rather than making you stitch together a series of photographs taken with a conventional camera, the Portal S1 uses a patented parabolic lens system to capture an image of the area surrounding the camera. A photographer simply snaps the image, then uses the bundled software to unwrap it. Expect this technology to make panoramic images a standard feature in online and multimedia publishing.

Be Here Corp., San Jose, CA; 408-501-0120; www.behere.com.

Olympus D-320L

TOSHIYUKI TOYOFUKU, JOHN KNEELAND, BARONE, DAVE VILLEUX

The Olympus D-320L has almost everything that a sophisticated, nonprofessional digital photographer could want: a razor-sharp five-element glass f2.8 autofocus lens, a megapixel CCD capable of XGA or 1,024-by-768 resolution, point-and-shoot simplicity, removable SmartMedia cards, and much more, including a video-out port for displaying your pictures on a TV. When coupled with an Olympus P-300 dye sublimation printer, the D-320L doesn't need a computer to produce prints.

Olympus America Inc., Digital Imaging and Systems Group; Melville, NY; 800-347-4027; www.olympus.com.

Winner: Hitachi MP-EG1A

HITACHI MPEGCAM TEAM

What will the future of digital video look like? The Hitachi MP-EG1A should give you an idea. This digital chameleon is the first video camera that captures both still and video images directly into the universally accepted MPEG-1 format.

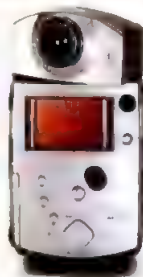
You can store up to 20 minutes of video on its 260MB PC Card hard disk. The video is captured at 30 frames per second (fps) at a resolution of 352-by-240—perfect for a video window on a Web site. The camera also captures up to 3,000 still images (at 704-by-480 resolution) in JPEG format, or 1,000 JPEG stills with 10 seconds of audio each for voice annotations.

Shaped similar to an electric razor,

the video camera fits easily in the palm of your hand. Simply turn it on, select the image type, line up the subject in the viewfinder, and press Record. There's a 6X power-zoom button for framing or following the subject and a 1.8-inch color LCD viewfinder to let you watch all the action.

You can transfer images to your PC either by swapping the PC Card drive into a PC Card reader or by attaching the camera to the kit's dedicated high-speed ISA serial board. Hitachi bundles comprehensive programs for viewing video, still, and audio files and for editing video and still files.

Hitachi Home Electronics America Inc., Norcross, GA; 800-448-2244; www.mpegcam.net.



Finalists:

Winner: Fujitsu Plasmavision

PLASMAVISION DEVELOPMENT TEAM

Some inventions take longer to mature and become marketable. After 15 years of development, the first commercially available full-color plasma panel is here. The Fujitsu Plasmavision, a 42-inch flat-panel display, is a herald of things to come for both ultra-large-screen computer displays and hang-on-the-wall TVs for the home.

A pixel in a plasma display works much like a familiar fluorescent light: Electrically charged gas emits ultraviolet light, which then strikes and excites phosphors that emit visible light. Plasma panels have been around nearly as long as the PC. The earliest Plasma panels were a rusty-red monochrome, used in transportable

computers and as large, high-resolution displays for engineering workstations. Only recently were phosphors developed for full-color displays, along with new fabrication techniques required to accommodate the red, green, and blue phosphors.

Plasma will enable screens much larger than is economically practical with conventional CRT or even LCD technology. Matsushita (the

parent company of Panasonic), Mitsubishi, NEC, and Pioneer have all demonstrated 40-inch or larger color panels, but Fujitsu is the first out of the gate.

Fujitsu General America Inc., Fairfield, NJ; 888-888-3424; www.plasmavision.com.



Finalists:

NEC XtraView

TATSUO NISHIMATA, HIDETOSHI USUI, CHRIS CONNERY, YOICHI MURAYAMA

One limiting factor in using LCD monitors in the workplace is the poor viewing angle. Only a user sitting directly in front of the panel can see the image. NEC is the first manufacturer to overcome this hurdle, with its XtraView LCD technology. In an XtraView panel, light passes through the crystals at a spherical/conical orientation. It's dispersed more efficiently, resulting in a distortion-free viewing angle (a full 160-degree swath). Available now in the MultiSync LCD2000 and MultiSync LCD400 desktop LCD monitors, XtraView technology should go a long way in making LCDs more compelling CRT replacements.

NEC Technologies Inc., Itasca, IL; 800-528-2783; www.nec.com.

Panasonic PanaFlat

C. WATANABE, M. HONDA, A. TAKE

Everyone likes the look of an LCD flat-panel monitor, but few can afford the high cost. Panasonic has finally perfected a true flat-faced CRT tube that can support multiple resolutions for computer displays: that 17-inch PanaFlat. Unlike supposed flat-square CRTs and aperture-grille tubes, a PanaFlat monitor is truly flat both horizontally and vertically, which produces a more inviting image. The PanaFlat tube also reduces ambient light reflection and delivers more uniform brightness across the entire screen.

Panasonic Computer Peripheral Co., Secaucus, NJ; 800-742-8066; www.panasonic.com/alive.



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Finally there is a cathode ray tube that truly lives up to the potential of the multimedia revolution. It's called Microfilter CRT. Featuring a system of color filters and a high-transmittance glass panel, Microfilter produces a 30% increase in contrast and brightness over our conventional CRTs. This means clearer moving images and sharper text than you've ever seen before. Unleash the full potential of multimedia with the Toshiba Microfilter CRT.

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Toshiba America Electronic Components, Inc. Electron Tube and Device Division One Pkwy., North, Suite 500, Deerfield, IL 60015, U.S.A. Tel: 1-800-879-4963

Finalists:

DMI (Desktop Management Interface) 2.0

DMTF DMI TECHNICAL DEVELOPMENT COMMITTEE: PAUL RUOCCHIO, CHAIRMAN

The emergence of DMI (Desktop Management Interface) 2.0, a specification defined by a consortium of vendors known as the Desktop Management Task Force (DMTF), has swiftly changed the way corporate PCs are purchased and maintained.

DMI is a means of examining a system's components and monitoring system hardware. Version 2.0 provides remote-console control, which increases administration flexibility. DMI makes it easier to service a large network, thus reducing the daily cost of maintenance.

DMTF (Desktop Management Task Force), Hillsboro, OR; 503-264-9300; www.dmtf.org.

Dolby Digital

DOLBY DIGITAL DEVELOPMENT TEAM

The Dolby Digital specification (formerly known as AC-3) takes an incredible step in digital audio encoding by letting six discrete channels be encoded at one-fourth the data rate of a typical stereo CD—a total of only 384 kilobits per second.

Since it uses separate channels for left, right, and center at the front, plus two separate surround channels and a subwoofer, the sound quality is excellent. The technology takes advantage of auditory masking, a psychoacoustic phenomenon that divides each channel's audio spectrum into narrow frequency bands of different sizes optimized to the frequency of human hearing.

Dolby Laboratories Inc., San Francisco; 415-556-0200; www.dolby.com.

**Winner: DVD-ROM**

DVD FORUM, LED BY TOSHIBA CORP. S.A., TIME WARNER INC., SONY ELECTRONICS INC., AND PHILIPS ELECTRONICS N.V.

Paradigm shifts don't happen every year, nor overnight. DVD has been in the works for years, but it's been worth the wait. In coming years, it should replace CD-ROM as the primary means of PC content distribution.

DVD disks come in four formats, ranging from single-sided, single-density disks with 4.7GB to double-sided, double-density 17GB disks. Such capacity will enable new types of multimedia-intensive applications, from single-disk mapping and database programs to edutainment packages to full-length movies with sound tracks in several languages. The DVD spec also calls

for drives to be backward-compatible with existing CD-ROM disks, so you can play the titles you already own.

DVD (which alternately stood for *digital video disk* and *digital versatile disk*) is actually a hybrid, created jointly by two groups that had been working on their own designs for new high-density optical disks. One group, made up of seven companies led by Toshiba, favored SD (Super Density). The other group, consisting of Sony and Philips, espoused MMCD (Multimedia CD). In 1995, the two groups agreed to create a single, unified DVD specification. The result is a familiar format with a wealth of new possibilities.



DEVELOPMENT TOOLS

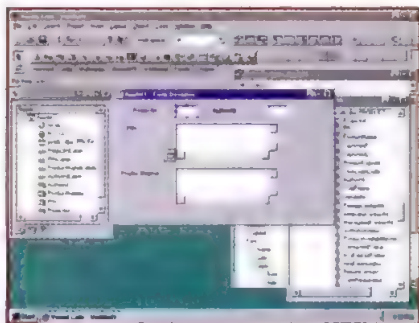
Winner: Visual Café for Java 2.0

MANSOUR SAFAI AND THE VISUAL CAFÉ FOR JAVA DATABASE DEVELOPMENT TEAM

Symantec's Visual Café for Java 2.0 Database Development Edition is a powerful third-generation Java database tool that features strong support for Sun's Java-

support and wizards are unsurpassed. Database access is handled by the included Symantec dbAnywhere middleware package. Java beginners and HTML designers can design data-aware forms with little programming using both the dbNavigator tool, which manages database connections, and wizards that let them create forms based on queries.

Visual Café offers an unequaled mix of target and compiler features for advanced users. It also features over 100 JavaBean components for a wide variety of user interface components, including multimedia and high-level beans for animated objects. Most JavaBeans can be attached to live data over the Internet. **Symantec Corp.**, Cupertino, CA; 800-441-7234; cafe.symantec.com.



Beans. Its integrated database middleware, compiler technology, and design environment are unmatched by other Java compilers and development tools. Visual Café's integrated database

Finalists:

Delphi 3 Client/Server Suite

DELPHI 3 DEVELOPMENT TEAM

Borland's Delphi continues on the cutting edge of Rapid Application Development. Version 3 adds impressive new capabilities for Internet and intranet programming, creation and use of ActiveX controls and forms, full support for Component Object Model (COM) and Distributed COM, and multiter client/server design.

Version 3 extends Delphi's reach considerably. It can automatically generate an ActiveX component from a Delphi component (or vice versa) and can turn a form into an ActiveX-powered applet. The new interface data type corresponds directly to a COM interface, giving Delphi a kind of multiple inheritance.

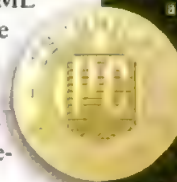
Borland International Inc., Scotts Valley, CA; 800-233-2444; www.borland.com.

Microsoft Visual Basic 5.0 Enterprise Edition

VISUAL BASIC DEVELOPMENT TEAM

Microsoft Visual Basic 5.0 Enterprise Edition improves on one of today's most popular RAD programming tools by adding new Internet features that bring your legacy applications into a Web-based world.

Throughout the product, the complexities of ActiveX are hidden from the programmer. Developers can design applications using ActiveX components that can run on Microsoft Internet Information Server (IIS) from behind the scenes. Another innovation is the powerful ActiveX Document Wizard, which lets existing code and forms run inside Web browsers. **Microsoft Corp.**, Redmond, WA; 800-426-9400; www.microsoft.com/vbasic.

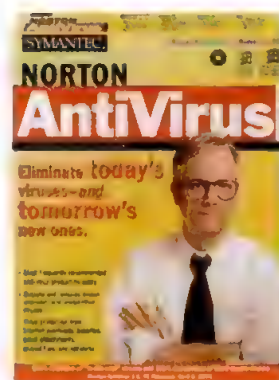


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AFTER HOURS

Winner: Force FX

IMMERSION CORP.: LOUIS ROSENBERG, DEAN CHANG, BRUCE SCHENA, ADAM BRAUN; CH PRODUCTS: CHARLES HAYES, BILL LUNDGREN, SCOTT CORDNER, DENIS VALENTINE

Using Immersion Corp.'s I-Force protocol, the Force FX from CH Products is an extraordinary joystick that provides game players with *force feedback*—tactile responses to events occurring within an on-screen game. The effect is amazing: While you're playing a game that involves driving a car over bumpy terrain, the joystick shakes in your hand. When you're flying a virtual plane that is under a barrage of enemy gunfire, you'll feel the impact of the bullets as they pummel the fuselage.

The Force FX's design is considerably larger and more elaborate than that of conventional joysticks. The entire Force FX controller is used during play, providing unprecedented game immersion. The Force FX's handle looks like a standard input device, but its resistance to your movements will vary, and it will even become unresponsive in reaction to game events. In essence, these capabilities work to provide an incredibly realistic flight-simulator experience. Software support for

force feedback hasn't quite kept pace with the peripherals, but it is becoming widespread, and patches for older games are forthcoming.



Force-feedback technology has also begun penetrating other markets. It has been swiftly adopted by a drawing stylus, and other derivative peripherals

are planned. And as a game controller technology, it is poised to revolutionize the industry. Many joystick manufacturers have force-feedback products in development, though the Microsoft Sidewinder Force Feedback Pro is the only other currently on the market.

Because driving games have emerged as the most popular application of the technology thus far, manufacturers are scrambling to put force-feedback steering wheels on the shelves as well.

CH Products, Vista, CA:
800-624-5804; www.chproducts.com.

ActiMates Interactive Barney

DON COYNER, ERIK STROMMEN, BRADLEY THOMPSON, JON ROSENBERG, RUSTY JEFFRESS, ALAN MCROBERT, DAVID MONTAGUE, LEO DEL CASTILLO

Battery-powered dolls that move body parts and play back recorded sounds are nothing new. Microsoft's ActiMates Interactive Barney can do all of that, but what makes it so amazing is that it's the first doll that fully interacts with your PC.

When set up to communicate with a PC's game port, this animatronic purple dinosaur works in tandem with an accompanying CD-ROM or special videotapes of Barney's TV show to provide a new and innovative interactive learning experience. It is the harbinger of a new breed of educational peripherals and interactive toys that work both independently and in conjunction with a computer for added capabilities.

Even on its own, Barney has all the functions of a typical high-tech doll: He can move his head and arms, sing songs, and play games. If you squeeze his hand, he counts and recites the alphabet. If you cover his eyes, he initiates a game of peek-a-boo. Underneath the plush exterior is 2MB of memory, which stores an impressive 2,000-word vocabulary and 17 different songs.

With a Microsoft transmitter box attached to your game port and the doll situated within 15 feet of your PC, Barney can fully interact via radio signals with various ActiMates software titles. His vocabulary expanded to an extensive 14,000 words, Barney coaches children as they learn to read or play educational games that teach colors, shapes, or letters. The physical Barney doll can even converse with the virtual on-screen Barney character. ActiMates Interactive Barney is the first fully interactive peripheral that is also a cute, standalone educational toy.

Microsoft Corp., Redmond, WA; 800-426-9400; www.microsoft.com.

**Ultima Online**

THE ULTIMA ONLINE DEVELOPMENT TEAM

Game designer Richard Garriott's magnum opus, Ultima Online, is the premier multiplayer fantasy role-playing game. Ultima Online is home to Britannia, a vast, graphical world of breathtaking beauty and complexity. Ultima Online marks the beginning of a new age in online social interaction and gaming, going far beyond the text-based, multiplayer adventure games (commonly known as MUDs, or Multi-User Domains) that preceded it.

Currently, most online graphical worlds resemble games like Quake, which function simply as passive backdrops for death matches. Britannia, by contrast, is fully interactive and alive—the most sophisticated and responsive game world yet created. An impressive dynamic economy, based on supply and demand and the transport of goods, drives the game. Players must learn to do business with other players, forging partnerships and fending off competition.

Britannia's ecological system is equally groundbreaking and fluid. Players can seriously affect the lives and habits of animals and creatures in the game, which can, in turn, affect the well-being of the human population. Other advances include the way the game deals with more experienced players who kill weaker new characters (this is called "newbie killing"). Origin has constructed a sophisticated justice system wherein evil players gain bad reputations and are hunted down by nonplayer guards.

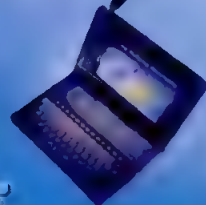
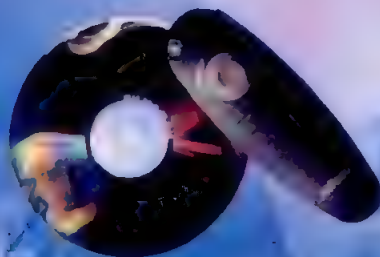
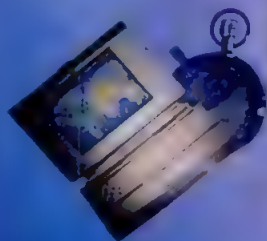
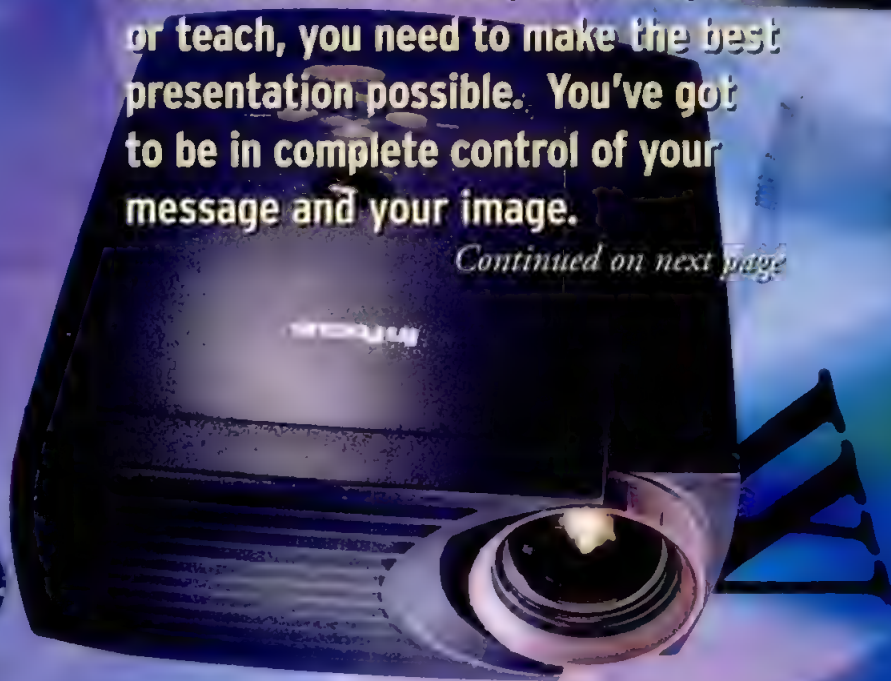
Ultima Online is also the most robust online game we've seen: Over 2,500 users logged in at once during the game's beta test, and double that number played on the game's second day in release. Roll all of these online brats into a single game and you have one of the most innovative gaming experiences of the year—online or otherwise.

EA/Origin Systems Inc., Austin TX; 800-245-4525; www.ultimaonline.com.

When you absolutely, positively have to look brilliant...

You've got your audience.
They're ready to look and listen.
But are you ready for them?
When it's time to sell, convince, lead
or teach, you need to make the best
presentation possible. You've got
to be in complete control of your
message and your image.

Continued on next page



InFocus



Happily, the days of fuzzy black-and-white overhead transparencies are mostly behind us and even upside down slides are becoming rather rare as presenters increasingly opt for data/video projectors.

These remarkable machines connect directly to your computer — whether it's a laptop, desktop PC or Macintosh, or even a UNIX workstation — and project the images you create with presentation application software like Microsoft PowerPoint or Adobe Persuasion so your audiences can see them. No more faded overheads or bulky flip charts. No more expensive 35mm slides. Your presentation can go straight from your computer to the screen or the wall.

And with the right projector, you can even take your show on the road. The lightest of the projectors available today is the In Focus LP™420. It's about the size and weight of a laptop computer and travels just as easily. Even heavier versions with a bit more projection power for larger audiences are tipping the scales at a mere 12 pounds.



That means you can work on your presentation or pitch on the airplane — or even minutes before you go on. The right projector will offer quick, simple setup and automatic image configuration. You'll be able to engage your audiences and keep them interested — without worrying about your projection equipment.

Presentations your audience will remember

The best of today's projectors can handle full-motion video. Instead of the static presentations of the past, you can easily

inject online, realtime content into your presentation and engage your audiences in ways you couldn't dream of before.

How about adding realtime product demos or online simulations to your presentation? Or perhaps you'll have reason to access a website or maybe you'll be able to drive home a point more effectively with a clip from the right movie. The

possibilities are endless, because presentations are no longer limited to a series of still-shots and awkward segues to other media.

Now whatever your computer can do, your presentation can do — simply, smoothly, easily. With today's projectors, you can show your audiences much more than images — you can take them to events.

Which one's for me?

As you explore the rich possibilities of presenting with a new-generation data/video projector, consider your needs as well as the projector's capabilities. Not all presenters are created equal. Neither are all projectors. You'll be able to spot which one is right for you as you prioritize your needs. In general, you'll want to consider the following.

Ease of use

Of course, you'll want projector controls that are simple and easy to use. Look for backlit LED buttons, intuitive, menu-driven controls and a handheld remote. Some projector vendors offer software that can help, too. In Focus Presents™ is utility software that ships with all In Focus® projectors. Once loaded on your PC, it creates settings that automatically show presentations with optimal resolution. The software is compatible with Windows 95/NT, automatically turning off screen savers, background utilities and unexpected interruptions during presentations.

Portability/weight

Lugging an extra 15 pounds or more through airports and hotels gets old *fast*. Little wonder, then, that demand for lightweight projectors is changing how the marketplace measures smallness. Although the industry typically has regarded anything under 12 pounds as "ultra-portable," In Focus' new LP420 personal projector redefines the term. It weighs in at just *seven pounds* and sacrifices very little.

Even if your projector is likelier to stay home serving a corporate department or campus, portability is important when the projector is moved from conference room to conference room. So even some high-end machines designed to be shared by 10 to 15 people, such as In Focus' LP730, weigh in at just 12 pounds and sport a handle integrated right into the form factor.

Image quality and sound

When your projector successfully renders a good image, its crisp, vibrant and true-to-life colors are visible in a fully-lit room. For ultimate image quality, the projector needs to be uniformly bright with good contrast and color range. To achieve this level of quality, one must consider the technology, the resolution, the type of bulb and of course the color contrast. These days, two different technologies make the "ultimate image" happen: LCDs (liquid crystal displays) and DLPs (digital light processing). LCD is a mature technology and one that In Focus uses in its LP730. DLP, on the other hand,

A look at the In Focus LP420 A Truly Personal Projector

Redefining the meaning of data/video projector portability, the LP420 from In Focus weighs just seven pounds — but its size doesn't stop it from packing quite a punch.

The new machine's breakthrough use of DLP technology means you'll get bright 800 x 600 pixel resolution, and you'll be able to display 1024 x 768 using the LP420's compression capabilities. Its 400-ANSI-lumens brightness, 270-watt metal halide lamp and a 150:1 contrast ratio ensure that your audience will see crisp, color-saturated images, including full-motion video. And the LP420's three-watt speakers with stereo loopthrough deliver dramatic, effective sound, too.

The folks at In Focus want your data/video projectors to be easy to use as well as lightweight and powerful. That's why the LP420 control panel is backlit and why it offers unequalled image configuration capabilities, including plug-and-project auto synchronization, auto tracking, auto positioning, auto source detect and black/white level detect. And In Focus' exclusive CableWizard makes quick work of connecting the projector to your computer.

This road champ is designed to be sleek and compact enough to fit into the same carrying case alongside your laptop computer yet powerful enough to project into a well lit room. It's all you'll need to look brilliant every time you present.

embodies a new, reflective-based technology introduced by Texas Instruments.

Which one's better? The answer depends on what you want in your projector.

In Focus uses DLP reflective capabilities to deliver remarkable power in a very small "personal" projector, the In Focus LP420. Utilizing the film-like quality inherent in DLP technology results in an excellent, smooth display of computer images or video footage from a VCR.

Resolution plays an important role in image quality since it determines the amount of information displayed as well as the quality of the image. These days, SVGA — 800 x 600 pixels — is the standard. Still greater XGA resolution (1024 x 768) can be found in high-end machines like the In Focus LP730, which can even project SXGA (1280 x 1020) images using advanced image compression.

The lamp is another determining factor in image quality. Metal halide lamps project more true colors than halogen lamps, last longer and don't burn out randomly. Therefore, if your projector uses a metal

halide lamp you'll avoid failure in the middle of a presentation.

Lastly, when attempting to optimize image quality, consider contrast. Contrast is the ratio of light projected when the



projector is showing a full white image versus a pure black image. So the greater the ratio, the more color saturated the image. You'll need a contrast ratio of at least 100:1 for the projector to be effective in a room with some lights on.

Also important is your projector's audio capability. You'll want one with built-in speakers that can play multimedia clips and provide audio background during your presentation.

Connectivity...

Look for projectors that are designed to make set-up easy.

In Focus' projectors come with CableWizard, a device that reduces the spaghetti of cables that run from a PC to a projector. It acts as a hub that integrates computer video/loophrough, mouse and

audio into a single cable linked to the projector.

Adjusting your projector should be easy, too. Its electronics should be able to automatically identify and interpret computer and video signals and adjust for optimal image quality. In Focus projectors include auto-sensing, which means you don't have to waste time fine tuning the image. The projector does it for you.

And compatibility

Make sure your projector will work with all the devices you need it to — your desktop PC at the office, the notebook computer you take on the road, your workgroup VCR, maybe even some of the machines at customers' and prospects' sites. The In Focus LP730 not only works with PCs/Macs — as does the LP420 — it is also compatible with workstations from Sun Microsystems, Hewlett-Packard and Silicon Graphics. With its high-resolution imaging, the LP730 clearly displays the fine lines and smaller fonts common in CAD/CAM, architectural, industrial, graphic and electronics applications.

At last: An end to the bloated 35mm slide budget

Calculating the return on your projection investment depends on how you look at it.

As every presenter knows, it's crucial that even static materials like 35mm slides are as timely and up-to-date as possible. That means you prepare them at the last possible moment and often get socked with

quick-turnaround charges by slidemakers. Hence 35mm slides typically cost up to \$15 each. That adds up very quickly when the typical 30- to 45-minute presentation includes some 30 slides.

Of course, you can measure the dollars you'll save when you no longer have to pay for creating 35mm slides, and those savings are impressive. At a minimal \$450 in 35mm slide costs per typical presentation, In Focus' LP420 pays for itself in fewer than 15 typical presentations. The higher-powered In Focus LP730, meanwhile, pays for itself in under 30 presentations.

Gauging how much the right data/video projector can boost your impact on your audiences is tougher. But when even your simplest presentations are smoother, more professional-looking and persuasive, you begin to get an idea. Add the ability to incorporate movie clips, interactive simulations or access to live websites during your presentation and you'll really get their attention. However you measure your presentation bottom line — in sales numbers, applause, questions, or grades — you'll see major improvements when you add the right projector to your presentation arsenal.

For more information on In Focus projectors, software and accessories — as well as some next-generation presentation hints from experienced experts — visit www.infocus.com/ziff or call 1-800-294-6400.

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The In Focus LP730 Highest Resolution, Workstation-Ready

If you demand high-power, high-resolution performance from your data/video projector, you're no longer forced to rely on heavy, labor-intensive devices.

In Focus LP730 features a zoom lens, ability to hook up satellite speakers and a handheld remote control. The 12-pound LP730 can be connected to powerful workstation computers and display the higher resolutions (up to 1280 x 1020) used in workstation applications. Its full-motion video includes comb filtering for better resolution.

Since the LP730 is designed for larger environments with bigger audiences, it uses an LCO optical system with a contrast ratio of 300:1 and a 2,000-hour metal halide lamp to project large, clear, color-saturated images.

Such resolution and contrast capabilities also make the LP730 an ideal daily workgroup tool for engineers, designers, developers and other professionals who need precision projection to share what's on their workstation screens.

Like other In Focus projectors, the LP730 comes with exclusive In Focus usability and connectivity features. It's also very quiet and cool, with no noisy, distracting fans. The LP730 can even project without a computer. Just team it with the In Focus LifeShow Pro Presentation Player for flawless presentations that practically give themselves.



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In Focus® LP420. It packs big-projector image quality into a 7-pound wonder
the size of a 3-ring binder. So now, not only are In Focus projectors the
world's most popular, they're also the easiest to carry.

InFocus®
makes it easy.



PERSONS OF THE YEAR

Winner: James Gosling and the Java Team

It's hard to imagine a product that has had more influence on the way we think about personal computing than Java. But while computing and the Internet are now givens in any discussion of Java, that's not how the product started out.

In the early nineties, a group known at the Green Team was formed at Sun with the initial idea of coming up with a simple way for various household appliances to connect and work together. Prominent on the team was James Gosling (above), who had previously designed the cMacs editor and NeWS, a windows-based interface for Unix. Gosling had



originally intended to work with C++ and make it more portable. Instead, he resolved the portability issue by placing his language in a "virtual machine." He named the language *Oak*. Oak was designed for *7 ("star-7"), a remote device for controlling smart appliances throughout the house. The group was renamed First Person, and it started working on interactive television.

With the advent of the World Wide Web and the need to create applications that would run on any Web client, the language was recast as a way of writing applications that would run on any platform. Gosling was responsible for the original language and VM, and many others were also involved, including Bill Joy, Richard Koch, Tim Lindholm, Jonathan Payne, Arthur van Hoff, and Frank Yellen.

The language was renamed Java in 1995 and released to widespread acclaim. That year, *PC Magazine* recognized Java with a Technical Excellence Award.

Since then, the basic Java concept has been enhanced and improved, with such items as JavaBeans—a method for tying together Java applets—and new procedures designed to make the original platform-independence of the language come closer to reality. As a programming language, a virtual machine, and a platform for applications development, Java has emerged as an alternative to the standard Windows-based client/server model. Java plays a major role in almost every discussion of where computing is heading. With that in mind, we name James Gosling and the Java Team as our Persons of the Year.

LIFETIME ACHIEVEMENT

Winner: Steven P. Jobs

Entrepreneur. Visionary. Showman. Creator of the "Reality Distortion Field." All of these terms—and more—have been used to describe Steven P. Jobs. But there's no denying that Jobs has been a guiding force behind many of the most important innovations in personal computing over the past two decades.

Some 20 years ago, Jobs and partner Steve Wozniak introduced the Apple II, the first personal computer to capture the imagination of the business community. Jobs and Wozniak had founded Apple the year before, and working from the proverbial garage, they built one of the icons of American business. Based on Wozniak's design, the Apple II was a pioneer in such areas as color graphics and inexpensive floppy disk drives. It became a platform for huge innovation in computer software, such as the first spreadsheet.

Jobs's most lasting contribution may come from his work in the early eighties, when he spearheaded the Apple team that would create the Macintosh.

The Mac was a big departure from computers of the era, introducing many users to such concepts as the graphical user interface, real font control, plug-and-play, and built-in networking. The Mac took many great ideas and made them accessible to the masses. In many respects, it set the direction for computing for a decade.

After leaving Apple in 1985, Jobs founded NeXT Computer. The NeXT machine boasted many pioneering features, including an object-oriented

approach to applications development, an integral magneto-optical disk, and a 3-D-like user interface based on the

Mach kernel. Although not many

NeXT machines were sold, the applications development platform was impressive, hosting such programs as the initial software for the World Wide Web. Jobs went on to acquire Pixar, which produced a number of pioneering films using computer graphics, notably including first entirely computer-generated full-length film, *Toy Story*.

Last year, Jobs sold NeXT to Apple Computer; he returned to Apple as acting CEO earlier this year. It's too soon to judge whether his latest tenure at Apple will prove ultimately successful, but there's no doubt that he brings a level of attention and excitement to Apple that has been missing for years. **PC**



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PCs

PC Labs tests 17 home PCs, divided into high-end and mainstream categories, plus three sub-\$1,000 PCs.

Right At Home

By Bill Howard

www.pcmag.com

Join us online for an interactive version of this story, complete with benchmark tests and an interactive price/performance index.

Many vendors will sell you a PC for use in the home and call it a home PC. But there are far fewer vendors, 15 to 20 at best, who sell PCs that are truly suitable for such use. Five years ago, a home unit was a vanilla PC with a 16-bit sound card, some free software, and (with luck) color-coded connectors for the cables. Now, home PCs are clearly different from business PCs. The cases, the monitors, and even in some instances the keyboards are different. There's a useful software bundle that targets the home or family user; it's not just a spreadsheet and a word processor. There isn't only sound but multimedia, including the ability to receive TV or cable broadcasts and send signals to a TV or VCR.

In terms of power, home PCs have virtually all the CPU and hard disk options of business models. In many cases, home users are more likely than business users to opt for faster CPUs and bigger hard disks.

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Editors' Choice

- High-end: Toshiba Infinia 7260, Dell Dimension XPS D300
- Mainstream: Quantex QP5/233 M-3



One of our high-end Editors' Choices, the Toshiba Infinia 7260, is a classic home PC, well suited for a variety of family users and uses. There are also systems

very well suited for home use that may not have all the homey touches such as the high-end Dell Dimension XPS D300 and the mainstream Quantex QP5/233 M-3, also Editors' Choices.

The Toshiba Infinia (\$3,400 street) offers all the thoughtful design touches you'd expect of a true home PC—from a contoured case to the InTouch Module, which controls functions including speakerphone, answering machine, CD player, television, and FM stereo. As for its performance, based on a Pentium II/266, the Infinia 7260 posted fine graphics scores on both our 2-D and 3-D tests, thanks to its 4MB ATI 3D Rage Pro card. The monitor-mounted speakers with integrated subwoofer provide good sound, and you also get a large bundle of software. In its first appearance on our annual *PC Magazine* Service and Reliability Survey, Toshiba did well, earning mostly average scores with one above-average rating.

At \$2,929 (direct), the Dell Dimension XPS D300 is a steal for a high-end system. You get a 300-MHz Pentium II, a fast 8GB Ultra ATA hard disk, and nVidia RIVA 128-based graphics, all of which add up to some great performance—especially on our 3-D tests. You'll get a good software bundle: the Microsoft Office 97 Small Business Edition and some home-oriented titles. You'll also get good sound from

the three-piece Altec Lansing speaker system. This isn't a beginners' system, though—Dell targets repeat home buyers. But if you ever need help, rest assured: Dell earned top honors on our Service and Reliability Survey.

Our winner in the mainstream category, the Quantex QP5/233 M-3 (\$1,799 direct) may not be a classic home PC, but it will satisfy your budget and your needs. Based on a Pentium MMX/233, it used an IBM ATA-3 hard disk and STB graphics to get solid performance, with especially good graphics scores. The QP5/233 M-3 also has a great software bundle. The sound provided by Altec Lansing speakers and an Ensoniq Audio PCI card was among the best in its class.

In the high-end category, the HP Pavilion 8180 (\$3,570 street) and the IBM Aptiva S6S (\$4,000 street) earned honorable mentions. Both are quintessential home PCs, offering sleek designs and programmable keyboards with one-touch access to the Internet and telephony applications. The Pavilion 8180 is especially user-friendly and includes a USB scanner, wireless mouse, and 50 hours of free Internet access. The Aptiva S6S provides one of the best DVD solutions we saw in this roundup. This model also offers some outstanding performance; a glitch in the sound levels on our test unit kept us from rating it more highly.

because they know from past experience how much power and capacity they need.

REVIEW CRITERIA

For this review, PC Labs sought out mainstream and high-end systems from the 15-plus vendors constituting the vast majority of the home PC market. The system had to be different from the 97 PCs reviewed in our previous issue covering managed corporate and professional/enthusiast PCs for business and power users. We asked for mainstream PCs that sell for no more than \$2,000 configured with 32MB of RAM, a 2GB or larger hard disk, a graphics adapter with 2MB of RAM, and a monitor—in this case, 15 inches (minimum). (Many ads cite PC prices without the monitor, which adds \$300 to \$400.) We left the choice of processor open but suggested 233-MHz Pentium MMX CPUs or equivalent.

For the high-end system, we didn't set an absolute price ceiling. We raised the hardware minimums to a 4GB hard disk and a 17-inch monitor. For CPU, we strongly urged the use of a 266-MHz Pentium II or equivalent. Both systems had to have home software bundles, sound adapters and speakers, modems, and CD-ROM or DVD drives. On the high-end PCs, DVD was strongly suggested.

Our filter netted us 11 vendors, which sent 7 mainstream and 10 high-end systems. These had to be available by early fall, and vendors who couldn't make our deadlines with production-level systems included Acer, AST, NEC, and Sony. (For more information on current offerings from these vendors, see Trends PCs in this issue.)

Separately, we requested and tested three sub-\$1,000 PCs from Compaq, Everex, and Monorail. They're evaluated in a sidebar ("Sub-\$1,000 PCs: The New Wave in Home PCs"). We also cover the Apple Macintosh in a sidebar "Apple Power Macintosh 6500/300". It's no secret that Apple is in dire straits and there's no guarantee that it will even be in the home PC business a year from now. Still, for some home users, the Mac makes sense.

WHAT YOUR MONEY BUYS

The sweet spot for the home PC market lies in the range of \$1,500 to \$2,000. That's what most people wind up spending when they're buying a system, including the monitor. You'll get a system with a 200- or

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4:10 p.m.
Update figures
in networked
database.

9:00 a.m.
Conference call with
plant manager.



10:15 a.m.
Give presentation
to sales team.



2:00 p.m.
Get information
from the Web for
afternoon proposal.



11:07 a.m.
Review financials
with marketing
team.



PCs Home PCs

Home PCs fall into three price bands: sub-\$1,000 systems, mainstream PCs hovering at around \$2,000, and high-end units priced above \$3,000. All come with Windows 95 and some basic software, which generally includes some sort of all-in-one package such as Microsoft Works, personal finance software, and reference and game titles. The trade-offs are in performance and hardware.



High-End PC (\$3,000+)

Processor, cache, and memory: Pentium II/266 or 300, 512K cache, 64MB of RAM.

Hard disk: 5GB to 6GB.

Graphics and monitor: 17-inch or larger monitor, 64- or 128-bit AGP graphics, 4MB of video RAM.

Multimedia: 64-bit sound with FM and wavetable, three-speaker system, DVD or 24X CD-ROM drive.

Modem/telephony: 56.6-Kbps modem, software with Internet, fax, voice mail, duplexed speakerphone.

Business Winstone 98 score: 20.

So What Do You Get?



Sub-\$1,000 PC

Processor, cache, and memory: Pentium-class CPU or Cyrix MediaGX CPU, 512K cache, 16MB of RAM.

Hard disk: 1GB to 2GB.

Graphics and monitor: 10- to 14-inch monitor, 16-bit graphics with 1MB of video RAM.

Multimedia: 16-bit sound, speakers (if any) integrated into the monitor, 16X CD-ROM drive.

Modem/telephony: 14.4- to 33.6-Kbps modem, Internet, basic software.

Business Winstone 98 score: 9.



Mainstream PC (\$2,000)

Processor, cache, and memory: Pentium MMX/200 or 233, 512K cache, 32MB of RAM.

Hard disk: 3GB.

Graphics and monitor: 15- or 17-inch monitor, 32- or 64-bit graphics with 2MB of video RAM.

Multimedia: 32-bit sound with FM, two speakers, 24X CD-ROM drive.

Modem/telephony: 56.6-Kbps modem, software with Internet, fax, voice mail, speakerphone.

Business Winstone 98 score: 15.

For reference: Highest Business Winstone 98 score to date: 22.9.

233-MHz Pentium MMX processor, which is as fast as Pentium MMX CPUs go. The original Pentium classic CPU, without multimedia-enhancing MMX technology, stops at 200 MHz, and Pentium classic systems are all but gone from the marketplace. If you buy a non-MMX system, it means you're getting a design that's at least six months old, which in the world of high

technology translates as "dated."

There's a dead spot in the market between \$2,000 and \$2,500. Vendors and stores find buyer resistance to MMX PCs selling for more than \$2,000, since savvy buyers perceive Pentium MMX to be a capable but still second-best and somewhat aging base technology, even though the MMX design dates only to last Janu-

ary. At the same time, it's hard as of mid-fall to put together a *good* Pentium II system for much less than \$2,500 with a monitor. Pentium II CPUs come in 233-, 266-, and 300-MHz variants—incorporating MMX technology and running equally happily on either Windows 95 or Windows NT. We expect capable Pentium II systems for home and for business to fall

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Price/Performance Index: Home PCs

Boasting a 300-MHz Pentium II processor, an 8.1GB IBM Ultra ATA hard disk, a DVD drive, an nVidia RIVA-based graphics card, and a 19-inch monitor, the high-end Gateway G6-300XL (\$3,699 direct) earns the top performance features score. The Editors' Choice-winning Dell Dimension XPS D300 (\$2,929 direct) offers many of the same components as the G6-300XL but uses a fast Toshiba 24X CD-ROM drive and has a 17-inch monitor. Both units also offer excellent sound—the G6-300XL through an Ensoniq chip set and Boston Acoustics speakers with a subwoofer, and the XPS D300 through a Creative Labs Sound Blaster AWE64 card and Altec Lansing speakers with subwoofer. These units bundle Microsoft Office 97 Small Business Edition and provide great 3-D and disk performance.

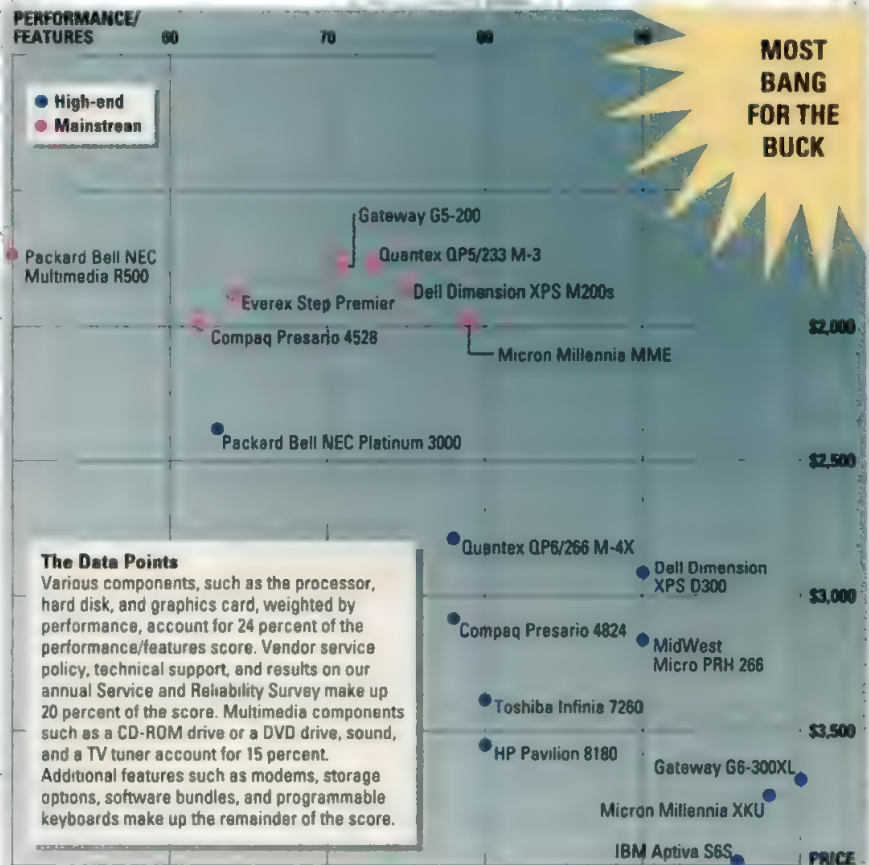
Among mainstream units, the Micron MME (\$1,989 direct) is the performance/features leader. The MME comes with a Pentium MMX/233, a 2GB Ultra ATA hard disk, a 17-inch monitor, and an Iomega Zip drive. It too includes Microsoft Office 97 Small Business Edition and boasts the highest Business Winstone 98 score in its class.

The Editors' Choice winner in the mainstream category, the Quantex QP5/233 M-3 (\$1,799 direct), is based on a Pentium MMX/233, comes with a 17-inch monitor and a 3.1GB IBM ATA-3 hard disk. It was a top performer in its class and features one of the better

sound subsystems in the mainstream category. It also has one of the most well-rounded software bundles in the roundup, with titles such as Compton's Interactive Encyclopedia, Corel Word-Perfect Suite, and Quicken SE.

The Toshiba Infinia 7260 (\$3,400 street), an Editors' Choice winner in the high-end category, is a classic

home PC. Its InTouch Module provides one-touch access to CD-ROM drive, speakerphone, and TV functions. Using a Pentium II/266, 6.2GB hard disk, and ATI-based graphics, the unit had some competitive performance. Toshiba tops that off with an appealing software bundle and a good sound system with subwoofer.



below \$2,000 early in 1998.

If you can afford a Pentium II system, by all means go for it. Also, don't overlook Intel-compatible CPUs from AMD (K6) and Cyrix (6x86MX), both of which have MMX-equivalent technology.

WHAT ABOUT SUB-\$1,000 PCs?

For the past year, you've been able to buy a \$1,000 home PC. The \$1,000 price point generated intense interest among users who couldn't afford a new PC before or who just didn't want to spend a lot on a new PC. Here's our take: Any PC is better

than none, but the \$1,000 PC has a number of compromises. The biggest was that until recently, \$1,000 was the advertised price for a PC without a monitor. Now, \$1,000 often includes a low-cost 14-inch monitor worth from \$200 to \$300. Memory is typically 16MB; you'll want 32MB to run Windows capably. The CPU is toward the lower end of the pecking order but still adequate. The hard disk is 1.6GB or 2.0GB. The modem may be 33.6 Kbps rather than 56.6 Kbps. The sound adapter uses passable FM synthesis, not wavetable. The speakers are small and to many will

sound tinny. Virtually every component is built by the lowest-cost provider. Feel, for instance, the quality of the tracking and the smoothness of the buttons on the mouse in a \$3,000 (versus a \$1,000) PC.

We believe you'll do better if you can budget \$1,250 to \$1,500 and get a system that will feel capable for two to three years. But although there are reasons why we think you're better off with a \$1,500 PC, the market has spoken. Sub-\$1,000 PCs now account for more than four of every ten home PC sales, according to market researcher Computer Intelligence.



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RIDING THE PERFORMANCE CURVE

We found these home systems performed on a par with the corporate and professional systems we reviewed in the past issue. Overall, the high-end systems were about a third faster than the mainstream systems.

You may want to pay special attention to the 3-D tests, because games are the one major application category that actually puts 3-D to work. There's almost no mainstream business software that uses 3-D today. Systems with cards based on the nVidia RIVA 128 chip set performed best. As for 2-D, though there are measurable differences among the graphics adapters, they're all generally capable. Make sure you get 4MB of graphics memory, because you'll need it to get true color images at 1,024-by-768 resolution.

BELLS AND WHISTLES

As a group, all the systems are relatively easy to set up. Some vendors have decided that since many users never read manuals, they won't pay to print the manuals. Electronic versions are on disk, and you can send away for printed manuals if you're so inclined, at a cost of \$10 to \$20.

Many of the systems have thoughtful design touches to make you more productive. For instance, some of the units have blinking message-waiting lights so you know immediately if you've had calls. Other extras we saw and liked were: one-touch voice-mail playback; buttons to start, stop, and skip tracks on audio CDs; prominent volume-control knobs and mute buttons; one-touch Internet access (press the button and it loads your Web browser and takes you to your home page); programmable keys to launch your favorite applications; and suspend buttons.

DVD drives were on four of the high-end systems. It looks as if the DVD drive market, already into its second generation (the first couldn't reliably read CD-R disks), is due for another iteration early next year. A year from now, the cost delta between DVD and CD drives will be less significant and DVD drives will be on the majority of PCs.

Some PCs had TV video input and output jacks so you can play or capture an external video or send an image from the PC to your TV or VCR in a usable format. Others had TV or TV/radio tuners.

One of the most impressive advances

Service and Reliability: Desktop Vendors

We rate vendors for which we received at least 50 responses in our latest Service and Reliability Survey of 17,000 subscribers. For details, see our July 1997 issue, page 184. The **reliability** ranking is a measure of satisfaction with the reliability of the vendor's desktops in use over the past two years. The **repair** and **technical support** rankings are measures of satisfaction with the vendor's repair service and support, respectively, for desktops in use over the past two years. The **percent needing repair** ranking is a measure of the proportion of desktops that the respondents indicated needed repair during the past 12 months. Here "significantly better than average" means the incidence of needed repairs was lower than average.

	Reliability	Repair	Technical support	Percent needing repair
Apple	Significantly better than average	Average	Significantly better than average	Significantly better than average
Compaq	Significantly better than average	Average	Significantly better than average	Significantly better than average
Dell	Significantly better than average	Average	Significantly better than average	Significantly better than average
Everex	Significantly worse than average	Average	Average	Average
Gateway 2000	Significantly better than average	Average	Significantly better than average	Average
Hewlett-Packard	Significantly better than average	Average	Significantly better than average	Average
IBM	Significantly better than average	Average	Significantly better than average	Average
Micron	Significantly better than average	Average	Significantly better than average	Average
MidWest Micro	Significantly better than average	Average	Significantly better than average	Average
Packard Bell	Significantly worse than average	Significantly worse than average	Significantly worse than average	Average
Quantex	Significantly better than average	Average	Significantly better than average	Significantly worse than average
Toshiba	Significantly better than average	Average	Average	Significantly better than average

has been in 3-D sound. Rudimentary 3-D processing has been available for several years, but the best of this bunch can deliver five-channel Dolby Pro Logic or Dolby Digital (AC-3) sound through just two speakers. You must be midway between them; those standing off to the side will hear sound but not the 3-D effect. Amazingly, if you are on-axis you can even hear sounds move from front to back, and you'll swear there are two speakers behind you.

Most of the speakers on the systems we reviewed come from famous names: Advent, Altec Lansing, Bose, Boston Acoustics, Cambridge SoundWorks, and Polk. System vendors realize they don't have the expertise the audio companies have. And they believe a prominent speaker brand attracts customers. Note that as you drop below \$2,000, you'll see fewer name-brand speakers on systems, or in some cases the brand names may have been applied to mediocre speakers.

Some of our systems came with a high-capacity removable disk beyond the standard 1.44MB floppy disk. Whether you choose Imation's 120MB SuperDisk, Iomega's 100MB Zip drive, or SyQuest's 230MB EZFlyer, they're an excellent investment of \$100 to \$150 and the most convenient way to back up your data. The other backup device we highly recom-

mend is an uninterruptible power supply (\$80 to \$200) that gives you 5 to 15 minutes of protection in case someone in your house trips the circuit breaker for your PC.

SOFTWARE: LESS IS MORE

Two years ago, the most aggressive PC makers bundled as many as 50 titles with their home PCs. Now the emphasis is on quality over quantity. In virtually every case you'll get integrated software (word processor, spreadsheet, database), an encyclopedia, and games. You may also get software for making holiday cards or photo posters and videophone software (to which you add a TV camera).

One missing piece of software is the Windows front end, an alternative menu that came out on many 1996 PCs when vendors thought users might not get the hang of Windows 95. Those are gone, but today a few vendors have less intrusive alternatives. For example, Packard Bell, the home market-share leader, has a mode that lets youngsters see only the applications intended for them; it also has an "idiot" mode for adults, rejecting dumb moves such as attempting to delete a system file.

One constant remains: Though 1998 edition software is available on store shelves for individual purchase, what you're getting in bundles is 1997 vintage

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programs shipped in the fall of '96. Vendors don't shift over the '98 software until their February or March system refresh, when they've had a chance to double-check the software for possible glitches.

If you're intent on getting software cheap, check out the extra cost bundles that Gateway 2000 and Micron offer. You can buy half a dozen titles for \$69 to \$100 extra—covering kids' "edutainment," 3-D games, and productivity, for instance.

WHO'S WHO IN HOME PCs

The home market has become so big that certain vendors are focusing on some but not all areas. IBM systems, for instance, sell well at the high end, especially with the S-class Aptiva split system (floppy disk/CD console on the desk, everything else hidden under the desk). Until recently, IBM had declined to take part in the \$1,000 home PC market, believing those buyers were less skilled and therefore more costly to support. It also *couldn't* take part, because it was not one of the industry's lower-cost producers. Given the success of that market, however, IBM has reconsidered. Conversely, Compaq covers every niche, from sub-\$1,000 PCs using the Cyrix MediaGX CPU up through \$3,000-plus systems with Pentium II/300 CPUs.

Direct-market sales leader Dell, which saw the home market (as opposed to the home-business market) as a potential support nightmare, now competes with home software bundles. Gateway and Micron have both always been strong in the home market. Packard-Bell has been dinged in the past for poor service and support and touts its vastly expanded support center in Utah and its alliance with NEC. (NEC and Packard-Bell PCs

are built in the same California factory.) NEC, which has always had a home-market presence, now has an aggressive direct campaign. Sony and Toshiba are targeting those desiring the most complete multimedia experience.

WHAT IF I WAIT?

Though the fourth quarter of the year is when more home PCs are sold, some buyers wonder what they gain by waiting. You won't find any paradigm-shifts in the next six months, only cheaper prices and more standard equipment. It's not like a year ago, when those who held off until January 1997 were able to buy Pentium MMX PCs. By the first half of '98, decent Pentium II systems will drop closer to \$2,000 and capable Pentium MMX systems may fall to \$1,000. Windows 98 will be available sometime in the second quarter. DVD drives will be cheaper and more bullet-proof. We may know which of the two 56-Kbps modem standards will prevail. And hard disks will approach 10GB capacity, in case 8GB isn't enough. Unless one of them is a must have, you'll probably agree that now is a good time for home PCs.

Compaq Presario 4824, Presario 4528

Presario 4824: Pentium II/233, SDRAM, 6.5GB hard disk, 17-inch monitor. Business Winstone 98 score: 18.1. \$3,100 street.

Presario 4528: Pentium MMX/233, SDRAM, 3.0GB hard disk, 15-inch monitor. Business Winstone 98 score: 13.9. \$2,000 street.

Compaq Computer Corp.'s array of Presario desktops for home users seems to have something for everyone, from the sub-\$1,000 Presario 2200 Cyrix MediaGX-based system through a full line of

Intel CPU-based computers (for more information on the Presario 2200, see the sidebar "Sub-\$1,000 PCs: The New Wave in Home PCs"). The value-class Presario 4528 is a well-equipped general-purpose system, while the upscale Presario 4824 boasts enough speed and capacity to impress its targeted market of users of 3-D applications.

Both Compaqs have rounded tower cases with trayless CD-ROM drives and backlit buttons for playing CDs and one-touch Internet access. Neither system comes with a DVD drive, though Compaq recently announced software-based DVD support (as opposed to a hardware-based decoder). Both systems come with a decent selection of Microsoft consumer titles, including Microsoft Encarta 97, Money, and Works, along with games.

For families looking for a fully configured PC, the 4528 is easy to like, covering all the bases with a 56.6-Kbps K56flex modem, MPEG-2 video playback, and Dolby Digital surround sound. The monitor-mounted JBL Pro speakers won't set the house rocking, but they're fine for general use.

The 4528's 430VX chip set and integrated S3 Trio64V2/DX graphics contributed to the system's relatively low graphics scores. Most other scores were average. After testing and some system disassembly, the 4528 no longer recognized a joystick used in software compatibility testing, which prevented X-Wing Fighter from running; otherwise, all of the best-selling CD titles installed and ran perfectly.

The 4824 is a step up in technology and price. It adds an LX chip set, an AGP slot, and 3-D video support with the ATI 3D Rage Pro AGP/2X chip set with 4MB of

SUITABILITY TO TASK: HOME PCs



	Compaq Presario 4824	Compaq Presario 4528	Dell Dimension XPS D300	Dell Dimension XPS M200s	Everex Step Premier	Gateway G6-300XL	Gateway G5-200	HP Pavilion 8180
Setup	Excellent	Excellent	Good	Good	Good	Excellent	Excellent	Excellent
Edutainment	Good	Fair	Good	Fair	Fair	Good	Good	Good
Productivity	Good	Fair	Excellent	Good	Fair	Excellent	Fair	Good
Sound	Fair	Fair	Excellent	Good	Poor	Excellent	Good	Good

Home PCs have to meet a variety of needs and accommodate users of different skill levels. Systems must be easy to set up, so that even novice users encounter no difficulty. Because all members of the family may use these systems, the PCs should offer well-rounded software bundles, with educational titles and games for kids as well as productivity packages such as

office suites and personal finance software for adult family members. And they must have sufficient performance levels and the multimedia hardware to support the software. Home systems are increasingly being integrated into home theater or entertainment centers, so a good sound system is also key.

SGRAM. The 233-MHz 4824 had reasonably competitive test scores for its class (most high-end systems used 266-MHz and 300-MHz CPUs).

The 4824 also adds the Compaq Phone Center, with full-duplex speakerphone and digital answering machine functions (both are accessible via one-touch buttons on the case), and the Compaq Creativity Imaging Center, with photo- and video-editing software. The 4824's wavetable audio and JBL speakers offer pleasant sound but lack the power to be a true home audio center. All software compatibility tests ran perfectly.

Compaq's good track record in *PC Magazine's* Service and Reliability Surveys should add confidence to Presario purchase decisions. The units have a one-year warranty, with on-site support for 90 days. Live technical support is available 24 hours, 7 days.

The 4528 does the job as an entry-level system without more costly technologies, while the 4824 has up-to-date components and faster performance for buyers willing to spend more.—Bruce Brown

Compaq Computer Corp., Houston; 800-345-1518, 281-370-0670; fax, 281-518-1442; www.compaq.com.

Dell Dimension XPS D300, Dimension XPS M200s



XPS D300: Pentium II/300, SDRAM, 8.4GB hard disk, 17-inch monitor. Business Winstone 98 score: 21.3. \$2,929 direct.

XPS M200s: Pentium MMX/200, SDRAM, 4.1GB hard disk, 17-inch monitor. Business Winstone 98 score: 15.9. \$1,879 direct.

Dell Computer Corp.'s Dimension XPS PCs, traditionally targeted at small-busi-



ness and government users, are now also intended for home use. The Dimension XPS M200s is a mainstream system for second-time buyers looking to upgrade performance at a reasonable cost. The loaded Dimension XPS D300, one of our Editors' Choice winners, is configured for high speed and capacious storage and hits the high side of the home market. Both machines serve their markets well, though neither has flashy consumer features like a one-touch Internet access button or a home telephony system.

Both Dimension XPS systems stress traditional computer performance over home-oriented features, but both are easy to set up. Each comes with a setup poster and labeled ports; modem and speaker cables are color-coded, and other cables have icons to aid identification. At press

time, Dell included the Microsoft Home Essentials 97 bundle with these systems but is considering adding another group of home titles as well. The Home Essential 97 package includes Microsoft Arcade, Encarta 97, Greetings Workshop, Word 97, and Works 4.0. Dell leases to home as well as business customers, and for \$299 it will transfer documents and data to a new computer if users roll over a lease.

The XPS M200s produced an average Business Winstone 98 score and above-average Business Disk, Business Graphics WinMark, and CD-ROM WinMark 98 ratings. The Altec Lansing speakers performed well, with good CD audio performance and the highest-rated MIDI sound production of all the systems we listened to in informal testing. Conflicts with Direct 3D drivers from the STB Nitro 3D graph-

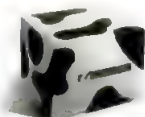
IBM Aptiva S6S	Micron Millennia XKU	Micron Millennia MME	MidWest Micro PRH 266	Packard Bell NEC Platinum 3000	Packard Bell NEC Multimedia R500	Quantex QP6/266 M-4X	Quantex QP5/233 M-3	Toshiba Infinia 7260
Good	Good	Good	Fair	Excellent	Excellent	Excellent	Excellent	Excellent
Good	Good	Good	Good	Good	Fair	Good	Good	Good
Excellent	Excellent	Good	Good	Good	Fair	Good	Good	Good
Good	Fair	Poor	Excellent	Fair	Fair	Excellent	Good	Good

The **setup** rating indicates how much setup assistance is provided for users. **Excellent** systems have setup posters, color-coded cables, and labeled ports. The **edutainment** rating indicates how well the unit suits educational and entertainment needs. We consider multimedia performance, software, and accessories. The **productivity** rating reflects how well a

system meets business and communications needs. Key factors include bundled office suites, communications hardware and software, and system performance (speed). To rate **sound**, a panel of *PC Magazine* staff members evaluates the quality of the PC's sound subsystem on audio and MIDI files.



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Sub-\$1,000 PCs: The New Wave in Home PCs

The sub-\$1,000 PCs segment of the home market is virtually exploding. According to Computer Intelligence (CI), a California-based research firm, roughly 40 percent of all home systems sold through retail outlets fall into this genre, which was nonexistent only a year and a half ago and accounted for only 9 percent of sales as recently as February. These modest machines—typically equipped with an older processor, 16MB of memory, and a 1GB-to-2GB hard disk—are bringing home computing to a previously untapped segment of the population. As of fall 1997, sub-\$1,000 PCs had reached 166-MHz clock speeds on the Intel side and 180-MHz speeds from Cyrix, and were beginning to include Intel's MMX technology.

In addition to the traditional home PCs covered in our main roundup, we also examined three representative sub-\$1,000 machines from Compaq, Everex, and Monorail.

Compaq's \$999 Presario is a significant cog in this expanding genre. The Presario 2100, announced in February, was the first machine to use Cyrix's MediaGX processor, a Technical Excellence Award finalist capable of redefining the way home PCs are constructed (for more information, see this issue's cover story, "The 14th Annual Awards for Technical Excellence"). This \$99 processor is not only unusually inexpensive, it also eliminates the need for several peripheral technologies that typically accompany a CPU. The processor incorporates a graphics accelerator, audio subsystem, PCI interface, and memory controller all on-chip.

The Presario 2100, equipped with the

inaugural 133-MHz MediaGX, performed just below the level of a Pentium/133 system, yet sold for roughly \$1,250 with a 14-inch monitor. In early summer, this paradigmatic machine was succeeded by the \$999 Presario 2200 (with 14-inch monitor), which has adopted the new 180-MHz MediaGX.

The 2200, like its predecessor, is black from desktop chassis to monitor. The unit has 16MB of standard

chassis integrates a pair of stereo speakers and a "phantom" subwoofer (a tube that provides additional bass), while the PC's CD-ROM offers external-play, fast-forward, and volume buttons. Its audio is comparable to that of many of the \$2,000-to-\$4,000 machines in our main review. The system lacks USB ports, but Compaq does provide a MIDI/joystick jack and a software bundle consisting of Microsoft Works,



Monorail Model 7366, Compaq Presario 2200, and Everex AGI Custom.

DRAM (part of which is dynamically allocated for graphics), a 1GB Seagate IDE hard disk, and an 8X CD-ROM drive. The unit's only expansion card, which sits in its only expansion slot, is a 33.6-Kbps modem, upgradable to 56.6-Kbps (K56flex).

The system, though certainly well conceived and assembled, does not perform at a level that its clock speed might suggest. The 180-MHz MediaGX is based on Cyrix's fifth-generation core technology, the 5x86, and performs only as well as a 150-MHz classic Pentium. The Presario 2200 scored an 8.6 during Winstone testing, relatively well below the 10.1 of Everex's Pentium/166 model, the AGI Custom. (This level of performance is roughly half that of today's high-end home PCs.)

Speed aside, the Presario 2200 is an attractive and viable home PC. Its

Money, Encarta, and Bookshelf and an Internet Setup utility (for use with America Online or SpryNet).

The AGI Custom from Everex is not as handsome nor as carefully designed. This mini-tower is merely last year's hardware with a new \$999 price tag. The PC's Pentium/166 sits on a Baby AT motherboard that lacks PS/2 connectors and USB ports. The keyboard connects to the unit via an older DIN connector, and the mouse plugs into one of two off-board serial ports.

The machine's S3 Trio64+ subsystem (1MB of DRAM) and 14-inch monitor manage graphics that are barely tolerable. Colors are watery, and images are blurred. During Winstone testing, however, the AGI Custom scored on a par with the Packard Bell Multimedia, a \$1,748 Pentium MMX/200 (that unit lacks L2 cache, however). The custom

Business Winstone 98

Compaq Presario 2200
(Cyrix MediaGX/180)

8.6

Everex AGI Custom
(Intel Pentium/166)

10.1

Monorail Model 7366
(AMD K5-PR166)

Not applicable: The product could not complete this test

AGI comes with 16MB of DRAM and a Seagate IDE hard disk (2GB), but lacks speakers and external CD controls. Everex's software bundle includes Microsoft Works, Money, Encarta, and NetMeeting.

Monorail, a two-year-old Atlanta-based manufacturer, has entered the sub-\$1,000 market with the Monorail 7366, a monputer (system and monitor in one) based on the 166-MHz K5. This 15- by 11- by 3.3-inch box, which sits atop an adjustable base, integrates a 10.4-inch DSTN display and two low-grade speakers along with all core system components. The unit has 16MB of EDO DRAM, a 2GB IBM hard disk, a Chips and Technologies graphics chip set (1MB DRAM), and a 16X CD-ROM drive. The RJ-45 jacks for the 33.6-Kbps modem are in the back.

The 7366 could not run our Winstone test (its display supports SVGA resolution only in virtual mode) and cannot play audio CDs with any aptitude, but the PC weighs only 17 pounds.

Some significant players in the sub-\$1,000 PC market, such as Acer America, Hewlett-Packard, and Packard Bell, were between lines at the time of this review and could not submit a system. Acer had pioneered the genre in late summer of 1996 with the "Back to School" Aspire. Its latest \$999 model is built around the 166-MHz version of AMD's K6 chip, a processor comparable to an Pentium MMX of similar clock speed. This machine does not include a monitor, but the company's \$999 K5 system—which mirrors a classic Pentium/166—ships with a 14-inch CRT. Hewlett-Packard has recently announced low-cost Pavilions, the 3100s. Based on a Pentium MMX/166, the 3100 sells for \$999 without a monitor. Packard Bell entered the market in January of this year with the Pentium/120-based C115 (\$1,000 with 14-inch monitor). Packard Bell now offers its M415 system, based on a Pentium MMX/166, for \$999, \$1,199 with a 15-inch monitor.—Cade Metz

ics card were the likely culprits when both Diablo and X-Wing Fighter hanged the XPS M200s. Other packages, however, installed and ran without a hitch.

The XPS D300 features an 8.4GB hard disk (another field-leading IBM Ultra ATA model), and an STB Velocity 128 3D AGP graphics card, based on an nVidia RIVA 128 chip set. These components contributed to average Business Winstone 98 and Business Graphics WinMark 98 scores, as well as top-notch Business Disk and 3D WinMark 98 ratings. Its CD-ROM WinMark 98 score was also above average. A faulty left stereo channel on the audio card initially interfered with informal audio testing, but we corrected the problem and the Altec Lansing speakers and subwoofer produced better-than-average sound. All five CD-ROM titles ran perfectly.

A long-term top-ranked vendor in *PC Magazine's* Service and Reliability Surveys, Dell shares top honors this year for desktop systems only with IBM. Dimension XPS systems are backed by a three-year-parts, one-year-labor warranty with on-site coverage during the first year and 24-hour, 7-day toll-free technical support. A new Web-based support mechanism customizes service and support data for customers who enter their system's Express Service Code.

For competitive performance at fair prices with field-leading service and support, the XPS M200s targeting users on a budget and the XPS D300 targeting those in search of performance prowess

are both highly recommended.—BB
Dell Computer Corp., Round Rock, TX; 800-388-8542, 512-338-4400; fax, 512-832-4329; www.dell.com. Circle 443 on reader service card.

Everex Step Premier

Pentium MMX/233, EDO DRAM, 3.1GB hard disk, 15-inch monitor. Business Winstone 98 score: 16.3. \$1,900 street.

Everex Systems' mainstream Step Premier midtower machine has average performance, a pedestrian sound system, and a somewhat meager software bundle.

The Step Premier was configured with a Matrox Mystique 220 PCI graphics card with 4MB of WRAM, a Toshiba 24X CD-ROM drive, and a 33.6-Kbps Zoltrix fax modem (upgradable to K56flex). The Step Premier also came with a bundle of Microsoft entertainment and productivity software, including Microsoft Encarta 97 and Works.

The combination of a set of small low-powered Formosa speakers and a Sound Conductor 16PNP FM synthesis sound board produced disappointing sound during an informal test with a MIDI file and an audio CD. The Step Premier posted average scores on most of our benchmark tests. None of the mainstream units had good 3-D results. The Everex machine showed no problems on our software compatibility tests.

The unit's ports are labeled, the system has a basic user manual, and a setup poster is included. Everex supports the



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Step Premier with a three-year warranty and one year of free on-site service. Technical support is available around the clock, and driver files can be found on the company's Web site.

This unit offers the basic components of a home PC and some competitive performance, but be prepared to beef up the Step Premier with additional software.

—Robert S. Anthony

Everex Systems Inc., Fremont, CA; 800-383-7391, 510-498-1111; fax, 510-683-2186; www.everex.com. Circle 444 on reader service card.

Gateway G6-300XL, G5-200

G6-300XL: Pentium II/300, SDRAM, 8.1GB hard disk, 19-inch monitor. Business Winstone 98 score: 21.8. \$3,699 direct.

G5-200: MMX Pentium/200, SDRAM, 2GB hard disk, 17-inch monitor. Business Winstone 98 score: 16.4. \$1,799 direct.

Gateway may be the second-leading direct seller of corporate PCs, but it's well ahead of Dell in the home PC market—ranking fourth overall behind Packard Bell, Compaq, and IBM. The company's G6-300XL model is a fine high-end home unit: Priced under \$3,700, it includes a DVD drive, a viable AGP solution, a TV tuner card, and a three-piece Boston Acoustics speaker system. The G5-200 may seem modest beside the G6-300XL, but it's more than worth the price tag.

These systems are well-made machines offering proficient multimedia. Equipped

with IBM's Ultra ATA hard disk, the G6-300XL was an above-average performer on our Business Winstone, CPUmark₃₂, and Business Disk WinMark 98 tests. The unit's AGP card (an STB Velocity 128 3D)—which, unlike some AGP solutions, benefits from AGP texturing—scored well on our 3D WinMark 98 test. A Toshiba DVD drive reads CD-ROMs at roughly 9X speed (and thus, was a poor performer on our CD-ROM WinMark 98 test) but offers acute audio and full-screen video when playing DVD films or DVD-ROM software. Gateway ships the unit with

Warner Brothers' Hollywood Studio Sampler, a collection of feature film previews in DVD format, and a coupon that you can mail in to Warner Brothers for a free full-length DVD movie.

The G5-200 was essentially an average performer for its class, but its motherboard integrates an adept graphics subsystem in the ATI Rage II+ (2MB SGRAM), which earned the unit an above-average Business Graphics WinMark 98 score.

Both systems offer Ensoniq PCI audio. The G6-300XL, which uses two small Boston Acoustics speakers and an immense subwoofer, performed particularly well during our informal sound jury testing. The G5-200 and its Altec Lansing speakers were less adept, though still satisfactory.

The G6-300XL ships with an STB TV Tuner that provides S-Video, Composite video, and TV and FM in-ports. Using the latter is made easy with bundled television feed software.

Both systems are further equipped with x2 56.6-Kbps telephony modems, Cypress's MegaPhone telephony software, stand-up microphones, and Gateway's Home Gallery (with productivity, reference, game, and edutainment titles).

Gateway also has two other significant home models: the G5-166 (\$1,499 direct), which includes a printer, and the D6-300 Destination Big Screen PC/TV (\$4,599 direct), with a TV tuner, a 31-inch display, and several wireless peripherals. The



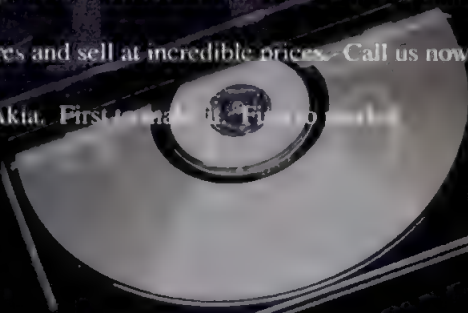
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HP Pavilion 8180

Pentium II/266, EDO DRAM, 6.2GB hard disk, 17-inch monitor. Business Winstone 98 score: 18.3. \$3,570 street.

The Pavilion 8180 is defined by its peripherals. This minitower is accompanied by a wireless mouse (which operates flawlessly at a distance of up to 15 feet), a USB color scanner, a programmable keyboard, and an antenna that receives wireless Internet feeds. This system is what a home PC should be—a multifunctional machine that, like a consumer electronics product, is easy to set up and operate.

Once you've powered on the Pavilion 8180, you'll find the HP Personal Guide, which gives you answers to commonly asked questions and provides quick access to some preloaded software, including a custom Web browser with 50 free hours of Internet Access (via GTE). HP's Support Center has extensive tutorials as well as technical support line listings.

The unit's multimedia keyboard integrates CD controls, a suspend button, message and speakerphone buttons (for use with the 56.6-Kbps K56flex modem), an instant Internet access button, and three shortcut buttons that you can program. Like Packard Bell NEC's Ready Series of home PCs, the Pavilion 8180 also ships with an Internet antenna that receives news, sports scores, and stock quotes from the AirMedia Internet Broadcast Network. HP's Personal Color Scanner (by Logitech) scans photos and documents up to 8.5 by 14 inches and works with Storm's EasyPhoto and Kai's Power GOO software (both standard). The unit also comes with Intel's VideoPhone and ProShare, as well as games, productivity, and edutainment titles.

The unit's Quantum Bigfoot drive led to a below-average Business Disk WinMark 98 score. 3D and Graphics WinMark 98 performance was also below average, because of the system's ATI 3D Pro Turbo graphics card (with 4MB of SGRAM, S-Video out, and Composite Video out). Other scores were average.

Apple Power Macintosh 6500/300

300-MHz PowerPC 603e, 64MB of RAM, 6GB hard disk, 17-inch monitor. \$3,600 street.

A speedy 300-MHz CPU, 3-D acceleration and an intuitive operating system make Apple Computer's Power Macintosh 6500/300, with the Home Edition software bundle, powerful and very easy to use. And the price makes it competitive with PCs in its class.

New Power Macintosh G3 systems will be replacing the 6500 series (as well as the 7300 and 8600 series) by the beginning of 1998. They will be available with Mac OS 8, a more efficient PowerPC G3 processor running at 233 or 266 MHz, with a 66-MHz system bus and an L2 cache bus running at half of the processor speed. Prices will range from \$1,199 to \$2,999, without monitor. These units were not available in time for this review.

You'll be glad to know that the usability features will stay the same,

something for everyone.

QuickTime movies zip along at near-perfect real-time speed on the 6500/300, thanks to its fast CPU and 64-bit ATI 3D Rage II graphics. The unit also has a Zip drive and 16-bit stereo SRS surround-sound, but if you want speakers other than those provided internally, you'll need a monitor with built-in speakers (\$100 extra). The volume control is right on the front panel; the subwoofer adjustment knob is located at the back of the unit. The system currently has two PCI slots on the motherboard.

Apple's only oversight with the 6500/300 was its removal of the computer's modem port. Although a 33.6-Kbps modem (56K is now standard) comes preinstalled in the 6500/300's communications slot, other peripherals plug into modem ports these days. Label printers and PDA docking stations are just two of the devices lost to users of this model.

Upgrading the unit is easy—too easy. The motherboard slides out vertically from the back, and although the manual warns against upgrading the RAM or installing cards yourself, the lure of a board so easily accessible may be too much for some do-it-yourselfers. We found the contact pins on the end of the board were easily bent after only a few

removals and insertions.

Apple and Apple users have been through trying times. With Microsoft's pledge in August of a \$150 million investment in Apple, and Apple's buyout of Power Computing's rival Macintosh clone line, Apple has been bolstered, but users now have fewer Apple-compatible choices, which may lead to higher prices.—*A.S. Berman*
Apple Computer Inc., Cupertino, CA; 800-538-9696, 408-996-1010; www.apple.com. Circle 441 on reader service card.



because setting up the 6500/300 is a breeze. The ports are marked with distinctive symbols and a large, easy-to-follow diagram is included. On boot-up, the user is greeted by a convenient graphical representation of the preloaded programs. An exhaustive tutorial with live-action video and animation is just a mouse click away.

Bundled with the 6500/300 are 15 CD-ROM titles, ranging from Grolier's Multimedia Encyclopedia and Now Touchbase to 3-D games like Mechwarrior II. There is definitely

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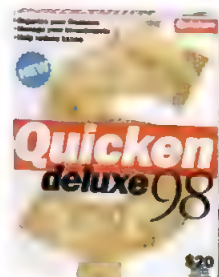
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BENCHMARK TESTS

Home PCs



The top home PCs in this roundup showed impressive performance that nearly matched that of corporate and professional PCs of the same CPU class.

What the Numbers Mean

Packed with Pentium II CPUs and 64MB of memory, the high-end home PCs boast enough power to fulfill the needs of demanding multimedia applications as well as those of home-office productivity. The Pentium MMX-based mainstream machines, however, were found adequate only for running business applications, and falter especially when it comes to 3-D rendering applications.

ZD Business Winstone 98 The three Pentium II/300 PCs from Micron Electronics, Gateway 2000, and Dell Computer Corp. earned the best overall Business Winstone scores. The PCs' Ultra ATA IBM Deskstar 5 hard disks and AGP graphics cards also contributed to the top results. With equivalent supporting hardware, however, Pentium II/266 PCs, such as the Toshiba Infinia 7260, IBM Aptiva S6S, and MidWest Micro PRH 266 are not far

behind the 300-MHz units. The 266-MHz PCs from Hewlett-Packard and Quantex MicroSystems, which used slow hard disks and graphics cards, performed on a par with 233-MHz units. The HP 8180 used a Quantum Bigfoot disk and an ATI 3D charger card. The Quantex PC had an STB 3D card and a Western Digital Ultra ATA disk but could not take advantage of the fast Ultra DMA protocol because of its 440 FX chip set.

All mainstream PCs showed satisfactory performance in running today's business applications, except for the entries from Compaq and Packard Bell NEC. These two PCs were weighed down by the older S3 Trio64 graphics chip set. The Packard Bell system was further hampered by a below-par CPU subsystem, which lacked an L2 cache.

ZD Business Graphics WinMark 98 In this group, the fastest graphics subsystem for business applications was the Diamond Viper V330 AGP card found in the Micron Millennia XKU, followed by the ATI 3D Rage Pro card used by the systems from MidWest Micro and Toshiba. The Quantex QP6/266, using an STB Nitro 3D card, had extremely poor performance with a score of 47—less than half the average for the group. Updated drivers did not affect the result.

The graphics cards in the mainstream PCs were chosen with cost in mind, but most of them are adequate for business applications. Micron's Millennia MME, which used a Diamond Stealth32 2000 Pro card based on S3's ViRGE/DX chip set, stands out with performance

▲ High scores are best.
▼ Low scores are best
Bold type denotes first place within each category.

	ZD Business Winstone 98 Score	ZD Business Graphics WinMark 98 Score	ZD Business Disk WinMark 98 Thousands of bytes per second	ZD 3D WinMark 98 Score	ZD CPUmark₃₂ Score	ZD CD-ROM WinMark 98 Thousands of bytes per second
HIGH-END PCs						
Compaq Presario 4824	18.1	91	859	317	600	1,400
Dell Dimension XPS D300	21.3	91.4	1,370	517	742	1,510
Gateway G6-300XL	21.8 ¹	96.2	1,400	501	744	861
HP Pavilion 8180	18.3	78	858	110	685	1,310
IBM Aptiva S6S	20.6	101	1,190	331	679	959
Micron Millennia XKU	22.9	129	1,370	526	742	852
MidWest Micro PRH 266	20.6	109	1,180	326	608	1,580
Packard Bell NEC Platinum 3000	18.1 ²	102.2	841	98	604	1,250
Quantex QP6/266 M-4X	17.0	47	1,110	56	693	831
Toshiba Infinia 7260	20.8	109	1,200	324	687	1,490
MAINSTREAM PCs						
Compaq Presario 4528	13.9	60	795	38	394	1,290
Dell Dimension XPS M200s	15.9	88	1,220	57	428	1,520
Everex Step Premier	16.3	76	970	64	467	1,280
Gateway G5-200	16.4	89	1,080	42	411	1,320
Micron Millennia MME	17.1	102	1,040	51	469	1,430
Packard Bell NEC Multimedia R500	10.6	37	745	30	262	1,260
Quantex QP5/233 M-3	16.2	94	1,060	30	462	1,450
	BETTER ►	BETTER ►	BETTER ►	BETTER ►	BETTER ►	BETTER ►

(1) With an Action, MPEG-1 352 x 240, 30-fps 300 Kbps clip (2) We tested at 32-bit color depth because this unit does not support 24-bit color

in the high-end PC class. The graphics performance of Compaq's and Packard Bell's systems was attenuated by their CPU subsystems.

ZD Business Disk WinMark 98 IBM Deskstar 5 Ultra ATA hard disks in the high-end systems from Gateway, Dell, and Micron yielded the best disk scores in the roundup, but the high transfer rates—close to 1,400 thousand bytes per second—were achieved with the aid of the Pentium II/300 CPUs that power these systems. Factoring out this CPU effect, the Maxtor 86480A8 Ultra ATA and Quantum Fireball ST disks found in MidWest Micro's and Toshiba's high-end systems, respectively, are almost in the same class as the IBM drive.

ZD 3D WinMark 98 Most of the high-end systems proved equipped to fulfill the needs of game enthusiasts, but the mainstream PCs were found wanting on this measure. The PCs from Micron, Dell, and Gateway, powered by graphics cards with the nVidia RIVA 128 AGP chip set, recorded the highest 3D WinMark scores we have seen. The high-end PCs from IBM, MidWest Micro, Compaq, and Toshiba used ATI 3D Rage graphics chip sets to achieve 3D WinMark scores above 300, which should be acceptable to most gamers. The nVidia and ATI chip sets support most of the 3-D rendering features in hardware. All other systems had inadequate 3-D performance.

ZD CPUMark₃₂ The CPUmark₃₂ scores for the high-end home PCs were in line with what we expected from their CPUs. The gain in performance offered by 300-MHz PCs over 266-MHz systems was only 8 percent, however, which is less than what one would project from the clock frequency difference of 12 percent. It's not really the

CPU's fault though: System memory is the bottleneck that prevents the Pentium II/300 from achieving its potential. (For more detail, see "Inside PC Labs," *PC Magazine*, September 23, 1997.)

All mainstream systems performed as expected, except the ones from Compaq and Packard Bell. The Compaq machine's 233-MHz CPU subsystem was 16 percent slower than that of other Pentium MMX/233 machines. Packard Bell's 200-MHz unit was a whopping 38 percent slower than other systems with the same CPU because it lacks an L2 cache.

ZD CD-ROM WinMark 98 The 24X (maximum) Toshiba XM-6102B consistently yielded top results in both high-end and mainstream PCs. The best CD-ROM score in this roundup, however, belonged to MidWest Micro's entry with a 24X (maximum) Pioneer DR-A24X drive, which has an 86-ms access time. The four high-end PCs with DVD drives—IBM, Gateway, Quantex, and Micron—had 8X-level scores.

MPEG video test Most tested home PCs had adequate performance in playing back our test clip scaled to full screen. Tested at 16-bit color depth, Everex's mainstream system dropped 60 of 448 total frames using a Matrox Mystique card, the same card that dropped more than 300 frames while playing back the same clip at a 24-bit color depth setting in our last PC roundup.—*Analysis by S. Jae Yang*

How We Tested

We tested systems in two categories: high-end home PCs and mainstream home PCs. Both groups ran Windows 95; the high-end units had Pentium II CPUs, 64MB of RAM, 4MB of graphics RAM, and 4GB or larger hard disks. The mainstream PCs had Pentium MMX CPUs, 32MB of RAM, 2MB or more of graphics RAM, and 2GB or larger hard disks. We stripped each system's start-up configuration of all processes or tasks except for Systray and Explorer. We defragmented the units' hard disks before each test and let Windows 95 manage virtual memory settings. We used each vendor's preinstalled graphics driver. We tested mainstream systems at 16-bit color depth, and high-end systems at true color (24-bit by default or 32-bit color if that was the only supported color depth).

ZD Winstone 98 is divided into two categories: **ZD Business Winstone 98**, focusing on mainstream applications, and **ZD High-End Winstone 98**, which emphasizes CPU and graphics-intensive applications. In this roundup, we ran only our Business Winstone 98 tests, which measure the time a PC takes to execute a set of application scripts that exercise nine of the best-selling Windows 95 applications. **Business Winstone 98** weights a given PC's test timings based on the applications' unit market shares; it derives a composite number and converts it to a relative score. (The score is relative to the performance of a Dell Dimension Pentium/133 with 32MB of RAM, at 1,024-by-768 resolution with 16-bit color, running Windows NT 4.0 with Service Pack 3. This base unit's score is defined as 10.)

ZD WinBench 98 measures graphics, disk, CPU, CD-ROM, full-motion video, and DirectDraw performance under Windows 95. Like our Winstone test program, **ZD Graphics WinMark 98** and **ZD Disk WinMark 98** are divided into Business and High-End sections. For this story, we ran only the business portion of these suites.

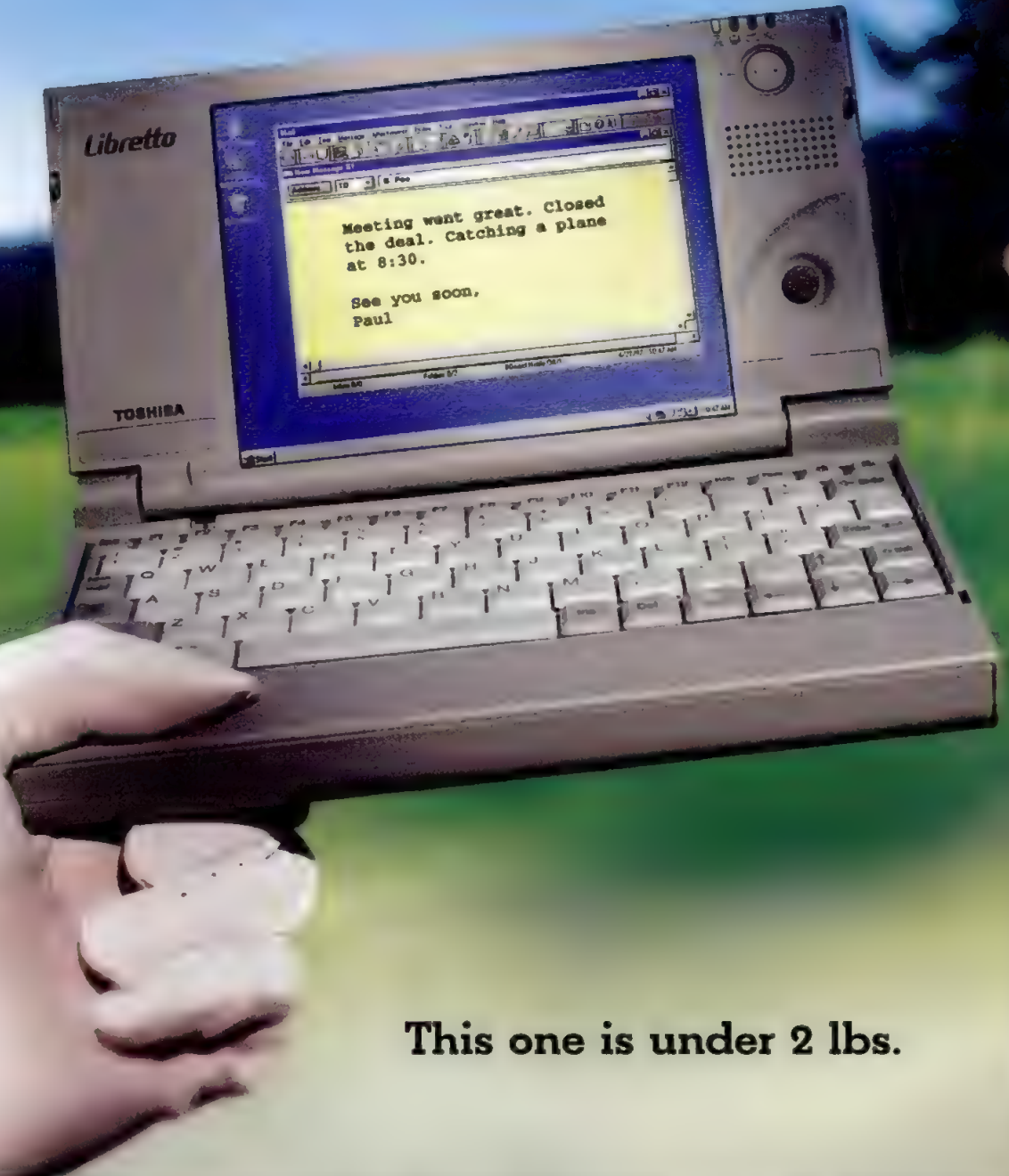
The **ZD Business Graphics WinMark 98** score is based on a log of GDI operations used in the Business Winstone 98 suite and represents the performance of each machine's graphics subsystem under Windows 95. Scores are normalized to reflect performance relative to the base system used for Business Winstone testing.

The **ZD Business Disk WinMark 98** score, based on a log of disk

continues

CD-ROM			Full-Screen Scaling ¹	
Transfer Rate: Inside (thousands of bytes per second) ▲	Access Time (milliseconds) ▼	CPU Utilization (percent) ▼	Maximum Frame Rate (frames per second) ▲	CPU Utilization (percent) ▼
1,800	90	5	61	53
2,170	95	5	34	89
1,230	142	3	63	51
1,750	94	4	64	50
1,540	127	4	68	54
1,540	180	4	63	52
2,320	86	22	61	52
1,750	113	52	45	87
1,220	146	51	42	74
2,160	97	62	74	48
1,790	99	82	46	68
2,170	96	11	53	61
2,150	94	93	29	97
1,830	97	24	52	62
1,860	85	46	53	66
1,800	106	13	33	96
2,170	99	54	52	61

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BENCHMARK TESTS

continued

functions used in the Business Winstone suite, represents the performance of each machine's disk subsystem under Windows 95. Results are reported in thousands of bytes per second and then converted to a harmonic mean. We then weigh this mean in the same way as the Business Winstone 98 score.

The **ZD CPUmark₃₂** score gauges the speed of a PC's processor subsystem—which includes the CPU, secondary cache, and system RAM—under a 32-bit operating system. The CPUmark tests emulate the CPU activity of real-world 32-bit applications.

The **ZD CD-ROM WinMark 98** tests gauge the performance of each machine's CD-ROM subsystem, which includes the CD-ROM drive, its adapter, and its required software drivers. The tests are based on a profile of today's most popular Windows CD-ROMs. We report the results of the CD-ROM **Transfer Rate: Inside** tests, which measure the throughput of a CD-ROM subsystem reading the inside track of the CD-ROM, the minimal level of performance for the drive. The CD-ROM **Access Time** score measures CD-ROM drive performance as it randomly accesses

2K blocks from the entire CD-ROM. The CD-ROM **CPU Utilization** score represents the percentage of the CPU's bandwidth occupied in servicing the CD-ROM subsystem as it retrieves data.

We also measure a PC's ability to play full-motion .AVI files. These tests run a video clip with four different codecs: Cinepak, Indeo 3.2, Indeo 4.x, and MPEG. We tested all systems using MPEG only, through ActiveMovie control. We report results from the **Full-Screen Scaling test**, which uses an Action, MPEG-1, 352-by-240, 30-frame-per-second, 300-KBps clip. We report **Maximum Frame Rate** and **CPU Utilization**.

3D WinBench 98 evaluates 3-D graphics performance. We first performed the **3D Quality** test to determine which of the 31 tested features the graphics card supports. We then run the performance portion of 3D WinBench 98 to obtain the **3D WinMark 98** score. The test is made up of 19 scenes; each scene is rendered by hardware if the graphics card was found to support all the 3-D options in the scene, based on the 3D Quality test. If not, the scene is rendered in software. We installed Direct3D 5.0 on each system before running the tests.

The unit's ISA sound card, offering both FM and wavetable synthesis, connects to a pair of midsize Polk Audio speakers. The Pavilion 8180 lacks a standard subwoofer (\$99 as an option) but nonetheless affords audio that garnered good ratings from our informal panel.

HP also markets the mainstream Pavilions 8140 and 8160, based on Pentium MMX 200- and 233-MHz, respectively, and the Pavilion 3100 (\$1,000 street), with a Pentium MMX/166 and 16MB of RAM (without monitor). The new Pavilion 8190 has all of the 8180's features, plus a DVD drive, for \$3,800 (street).—CM

Hewlett-Packard Co., Palo Alto, CA; 800-752-0900; 415-857-1501; www.hp.com.
Circle 446 on reader service card.

IBM Aptiva S6S

Pentium II/266, SDRAM, 6.4GB hard disk, 17-inch monitor. Business Winstone 98 score: 20.6. \$4,000 street.

Targeting experienced PC buyers interested in multifunction home computers, the IBM Aptiva S series is packed with hot features. Though hampered slightly by a bug in the audio driver, this otherwise impressive system delivers on its promise of strong performance in both multimedia presentation and traditional applications.

The Aptiva S6S has a split design: The DVD and floppy disk drives sit in a module beneath the monitor, and other main components, including a Zip drive, are housed in a minitower case. Full-duplex speakerphone and digital answering machine capabilities are standard, as is VideoPhone receiver software. A customizable keyboard with EZ Buttons lets you play back telephone messages, access the Internet, or launch favorite applications. In addition, the system has Dolby Digital sound with Bose Acoustimass speakers and subwoofer. It also comes bundled with Adobe Photo Deluxe, Kodak Photo Director, Lotus SmartSuite, Quicken SE, and some good games, among other titles.

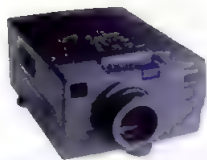
The Aptiva S6S's IBM hard disk and on-board ATI 3D Rage Pro AGP graphics controller helped it obtain average scores on most of our tests. Its DVD drive, however, yielded a below-average CD-ROM WinMark 98 score.

The unit had fine DVD video playback, but the audio signal suffered from noticeable breaks. IBM is working to remedy the breaks and to increase the overall volume produced by the system's audio chip, which doesn't do justice to the unit's DVD drive or speakers. Even with limited volume, the unit's audio quality was well rated for audio CDs on informal testing. But its MIDI playback was not as good.

All five CD titles installed correctly, but the often-problematic X-Wing Fighter caused the system to crash after instal-



HP Pavilion 8180



PRESENTATIONS

Bundled software lets you upload presentation slides into the PhotoPC 600. Simply connect to any projector or TV to present.



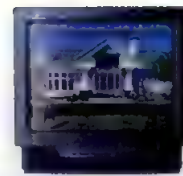
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lation, which may have been due to a joystick or Direct3D driver conflict.

Consistently a top-rated vendor in *PC Magazine's* Service and Reliability Surveys, IBM shared top honors with Dell this year. Other Aptiva home user lines include the E series for budget buyers, based on the AMD K6 CPU, and the Aptiva L series, with traditional cases and no DVD drives.

When the audio software kinks are worked out, this unit will be an ideal system for well-heeled consumers.—BB

IBM Consumer Division, Research Triangle Park, NC; 800-426-7235, 919-517-2430; www.pc.ibm.com. Circle 447 on reader service card.

Micron Millennia XKU, Millennia MME

Millennia XKU: Pentium II/300, 6.2GB hard disk, 19-inch monitor, SDRAM. Business Winstone 98 score: 22.9. \$3,757 direct.

Millennia MME: Pentium MMX/233, 2GB hard disk, 17-inch monitor, SDRAM. Business Winstone 98 score: 17.1. \$1,989 direct.

With its mainstream Pentium MMX/233 Millennia MME and its high-end Pentium II/300 Millennia XKU, Micron Electronics targets, respectively, the family and game-maven sectors of the home PC market. The XKU is a great choice, boasting some of the best performance in this roundup and reasonably good sound. The MME has some fine extras but was an uneven performer, and its sound was poor. Both units have good software bundles.

The XKU and the MME each came with an Iomega Zip Drive, a 56.6-Kbps x2 fax modem, and Microsoft Office 97 Small Business Edition. The XKU also offers an impressive set of multimedia features: a 19-inch monitor, a DVD drive, a Diamond Viper V330 AGP graphics board, and an Elecede Technologies E4 CoolDVD PCI board. The XKU also came with a Silent Steel DVD disk. The MME included a Hitachi 24X CD-ROM

drive and a Diamond Multimedia 3D Stealth 2000 Pro graphics board.

Posting the roundup's top scores on our Business Winstone 98, Business Graphics WinMark 98, and 3D WinMark 98 tests, the XKU was a great performer. Its AGP-based graphics undoubtedly helped. Its Business Disk WinMark 98 and CPUmark₃₂ scores were also above average and among the highest in the roundup. Since DVD drives are generally slower than standard CD-ROM drives, the unit earned a below-average CD-ROM WinMark 98 rating.

The MME had an above-average Business Winstone 98 score and an average disk result, but its 3D, Graphics, and CD-ROM WinMark scores were all below average.

Both Millennials came with integrated Yamaha audio chip sets with FM synthesis (the XKU now ships with a Creative Labs Sound Blaster AWE64 card). The MME had a set of small Advent speakers, and the XKU came with an impressive Cambridge SoundWorks/MicroWorks speaker system—which includes two small speakers and a large subwoofer. Audio CD playback was fairly good in the XKU but poor in the MME; both units had poor MIDI audio.

With each system, Micron bundles one

SUMMARY OF FEATURES

Home PCs

Price of tested configuration All prices include monitors. For PCs sold through resellers, assume that street prices are 15 to 20 percent lower than list prices. Some vendors factor this discount into their quoted prices; in such cases, we indicate that the cited price is a street price. All street prices are rounded to the nearest \$10. Some vendors sell directly to customers; such prices are listed as direct prices and are not discounted.

Installed RAM type Synchronous DRAM (SDRAM) offers a performance advantage over extended data out (EDO) DRAM.

Hard disk interface Fast ATA supports PIO mode 3 and multiword DMA mode 1 and has a maximum burst transfer rate of 13.3 MBps. Fast ATA-2 drives support up to PIO mode 4 and multiword DMA mode 2 and have a 16.7 MBps maximum burst transfer rate. ATA-3 drives offer enhanced features such as plug-and-play, with the same maximum throughput as Fast ATA-2 drives. Ultra

ATA drives support the Ultra DMA protocol, which supports a burst throughput of up to 33.3 MBps.

Monitor manufacturer and model (measured diagonal size, in inches) We list the measured viewable area on the monitor.

USB ports Designed to recognize peripherals instantly (plug-and-play), the Universal Serial Bus can accommodate up to 63 devices such as phones, modems, printers, and mice.

Integrated software refers to a software package that includes unified word processing, spreadsheet, and database programs, such as Microsoft Works 4.0 or Corel Office Professional for Windows 95.

A Windows from end is a preinstalled program provided by the manufacturer to help familiarize the user with the PC and its features.

Finance and reference list the software packages included that fit into these two categories.

HEY YOU PREPPY BONEHEAD!
You thought I was such a
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WELL I wrote something
for you. JUST
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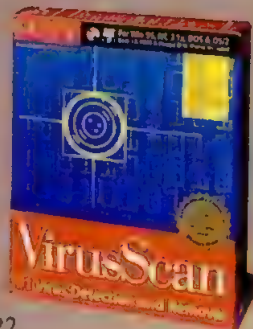
All over the world nerds are getting their revenge. By writing computer viruses that get into your computer and do things like destroy your files or corrupt your operating system.



Worldwide, more people use
VirusScan than all other
anti-virus products combined.
Source: IDC 1995

These viruses enter your computer over the internet, through email, or even by sharing computer games. But VirusScan thwarts these threats completely. Its Hunter Technology detects 100% of the world's known viruses. And our unique SecureCast feature automatically pushes updates to your PC to protect you from the latest virus strains. Maybe that's why VirusScan is the leading anti-virus software, with over 25 million customers.

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www.mcafee.com



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SUMMARY OF FEATURES

Home PCs



■ YES ■ NO

Products listed in review order

	Compaq Presario 4824	Compaq Presario 4524	Dell Dimension XPS D300	Dell Dimension XPS M200s	Everex Step Premier	Gateway 68-300XL	Gateway G5-200
Category	High-end	Mainstream	High-end	Mainstream	Mainstream	High-end	Mainstream
Price of tested configuration	\$3,100 street	\$2,000 street	\$2,929 direct	\$1,879 direct	\$1,900 street	\$3,699 direct	\$1,799 direct
Processor	Pentium II/233	Pentium MMX/233	Pentium II/300	Pentium MMX/200	Pentium MMX/233	Pentium II/300	Pentium MMX/200
Installed RAM type	SDRAM	SDRAM	SDRAM	SDRAM	EDO DRAM	SDRAM	SDRAM
Hard disk	Quantum Bigfoot	Seagate Medalist	IBM DHEA-38451	IBM DCAA-34330	Western Digital Caviar 33100	IBM DHEA-38451	Quantum Fireball ST
Capacity and interface	6.2GB Fast ATA-2	3.1GB ATA-3	8.1GB Ultra ATA	4.1GB ATA-3	3GB Fast ATA-2	8.1GB Ultra ATA	2GB Ultra ATA
Graphics adapter (interface)	Integrated (AGP)	Integrated (PCI)	STB Velocity 128 3D (AGP)	STB Nitro 3D (PCI)	Matrox Mystique 220 (PCI)	STB Velocity 128 3D (AGP)	Integrated (PCI)
Memory amount and type	4MB SGRAM	2MB DRAM	4MB SGRAM	4MB SGRAM	4MB SGRAM	4MB SGRAM	2MB SGRAM
Graphics chip set	ATI 3D Rage Pro AGP 2X	S3 Trio64V2/DX	nVidia RIVA 128	S3 ViRGE/GX	Matrox MGA-1064SG-H	nVidia RIVA128	ATI 3D Rage II+DVD
Monitor (measured diagonal size, in inches)	Compaq 1725 (15.9)	Compaq 312A (13.8)	Philips D1028L 1000LS (15.9)	Philips D1028L 1000LS (15.9)	DEO ISAE (13.8)	Gateway EV900 (17.8)	Gateway EV700 (15.9)
Installed external RAM cache and type	512K pipelined-burst	512K pipelined-burst	512K pipelined-burst	512K pipelined-burst	512K pipelined-burst	512K pipelined-burst	512K pipelined-burst
Motherboard manufacturer	Compaq	Compaq	Dell	Dell	Intel	Intel	Intel
Chip set	Intel 440LX	Intel 430VX	Intel 440LX	Intel 430VX	Intel 430TX	Intel 440LX	Intel 430TX
Expansion-bus slots	3 ISA, 2 PCI, 1 PCI/ISA	2 ISA, 1 PCI/ISA	1 ISA, 3 PCI, 1 PCI/ISA	2 ISA, 3 PCI, 1 PCI/ISA	3 ISA, 3 PCI, 1 PCI/ISA	1 ISA, 3 PCI, 1 PCI/ISA	2 ISA, 3 PCI
Front-accessible drive bays (5.25" / 3.5")	3 / 1	2 / 1	2 / 3	2 / 3	3 / 2	4 / 1	1 / 1
Internal drive bays (5.25" / 3.5")	1 / 0	1 / 0	0 / 2	0 / 2	0 / 3	0 / 6	1 / 1
Power-supply wattage	165	75	200	200	235	200	145
Parallel/serial/USB/mouse ports	1 / 1 / 2 / 1	1 / 1 / 2 / 1	1 / 1 / 2 / 1	1 / 1 / 2 / 1	1 / 2 / 2 / 1	1 / 2 / 2 / 1	1 / 1 / 2 / 1
Multimedia and Communications							
Sound adapter	ESS ES1887	ESS ES220	Creative Labs Sound Blaster AWE64 Value	Creative Labs Vibra 16C	Formosa Sound Conductor 16PnP	Ensoniq ES 1370	Ensoniq ES 1370
MIDI synthesis type	FM	Wavetable	FM, wavetable	FM, wavetable	FM, wavetable	Wavetable	Wavetable
Speakers	JBL Pro	JBL Pro	Altec Lansing ACS-290 with subwoofer	Altec Lansing ACS-90	Benwin Company BW-6914	Boston Acoustics 01960 with subwoofer	Altec Lansing ACS41
CD-ROM or DVD drive speed and model	12X-24X Matsushita CDR-5850	12X-24X Matsushita CDR-5850	12X-24X Toshiba XM-6102B	12X-24X Toshiba XM-6102B	12X-24X Toshiba XM-6102B	9X DVD Toshiba SD-M1002	12X-24X Toshiba XM-6002B
Backup or extra storage device	None	None	None	None	None	None	None
TV tuner/video in/video out	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Microphone/Headphone/Joystick	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Data/fax modem speeds in Kbps (56K technology, where applicable)	56.6 / 14.4 (K56flex)	56.6 / 14.4 (K56flex)	56.6 / 14.4 (x2)	56.6 / 14.4 (x2)	33.6 / 14.4	56.6 / 14.4 (x2)	56.6 / 14.4 (x2)
Modem software (telephony/answering machine)	Compaq Phone Center	None	Global Village's Focal Point	Global Village's Focal Point	None	Cypress Megaphone	Cypress Megaphone
Software							
Software suites	MS Works 4.0	MS Works 4.0	MS Office 97, Small Business; MS Works 4.0	MS Office 97, Small Business; MS Works 4.0	MS Works 4.0	MS Office 97, Small Business	MS Works 4.0
Finance	MS Money	MS Money	None	None	MS Money	None	MS Money 97; Quicken, Special Edition
Reference	MS Encarta 97	MS Encarta 97	MS Encarta 97	MS Encarta 97	MS Encarta 97	MS Encarta 97, The Ultimate Human Body 97	MS Encarta 97, The Ultimate Human Body 97
Setup, Service, and Support							
Setup poster/Getting-started video/Color-coded cables	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
24-hour, 7-day live technical support	■	■	■	■	■	■	■
Standard warranty on parts/labor	1 year/1 year	1 year/1 year	3 years/1 year	3 years/1 year	3 years/1 year	3 years/3 years	3 years/3 years
On-site service charge (first year)	Included (90 days)	Included (90 days)	Included	Included	Included	Included	Included
24-hour turnaround for parts replacement	■	■	■	■	■	■	■

N/A—Not applicable: The product does not have this feature.

HP Pavilion \$180	IBM Aptiva S65	Micron Millennia XKU	Micron Millennia MME	MidWest Micro PRH 266	Packard Bell NEC Platinum 3000	Packard Bell NEC Multi- media R500	Quantex QPS/266 M-4X	Quantex QPS/233 M-J	Toshiba Infinia 7260
High-end \$3,570 street Pentium II/266	High-end \$4,000 street Pentium II/266	High-end \$3,757 direct Pentium II/300	Mainstream \$1,989 direct Pentium MMX/233	High-end \$3,180 direct Pentium II/266	High-end \$2,400 street Pentium MMX/233	Mainstream \$1,750 street Pentium MMX/200	High-end \$2,799 direct Pentium II/266	Mainstream \$1,799 direct Pentium MMX/233	High-end \$3,400 street Pentium II/266
EDO DRAM Quantum Bigfoot	SDRAM IBM DHEA-36480	SDRAM IBM DHEA-36480	SDRAM Western Digital Caviar 22100	SDRAM Quantum Fireball ST	EDO DRAM Seagate ST34342A	EDO DRAM Maxtor 84320A8	EDO DRAM Western Digital Caviar 34300	EDO DRAM IBM DAQA-33240	EDO DRAM Maxtor 86480A8
6.2GB Fast ATA-2	6.2GB Ultra ATA	6.2GB Ultra ATA	2GB Ultra ATA	6.1GB Ultra ATA	4.1GB Ultra ATA	4.1GB ATA-3	4.1GB Ultra ATA	3.1GB ATA-3	6.2GB ATA-4
ATI 3D Charger (PCI)	Integrated (AGP)	Diamond Viper V330 (AGP)	Diamond Stealth 32 2000 Pro (PCI)	ATI 3D Rage Pro (AGP)	Diamond DM975 (PCI)	Integrated (PCI)	STB Nitro 3D (PCI)	STB Nitro 3D (PCI)	ATI 3D Rage Pro (PCI)
4MB DRAM	4MB SGRAM	4MB SGRAM	4MB DRAM	4MB SGRAM	4MB EDO DRAM	2MB DRAM	4MB SGRAM	4MB SGRAM	4MB SGRAM
ATI 3D Rage II+DVD	ATI 3D Rage Pro AGP X2	nVidia RIVA128	S3 VIRGE/DX	ATI 3D Rage II AGP X2	Trident 3DImage 975	S3 Trio64V+	S3 VIRGE/GX	S3 VIRGE/GX	ATI 3D Rage Pro
HP M70 (18.2)	IBM MM75 (15.9)	Hitachi CM751V (18.0)	Micron 700SGx (18.0)	Midwest Micro DJM-702 (18.1)	Packard Bell 7480 (18.2)	Packard Bell 5480 (13.5)	MAG Innovision 720JV2 (16.1)	MAG Innovision 720JV2 (16.1)	Toshiba 1776M (18.2)
512K pipelined- burst	512K pipelined- burst	512K pipelined- burst	512K pipelined- burst	512K pipelined- burst	512K pipelined- burst	512K pipelined- burst	512K pipelined- burst	512K pipelined- burst	512K pipelined- burst
Intel	IBM	Intel	Micron	ASUSTek	Packard Bell	Packard Bell	Netrix	Netrix	Intel
Intel 440FX	Intel 440LX	Intel 440LX	Intel 430TX	Intel 440LX	Intel 440FX	Intel 430VX	Intel 440FX	Intel 430TX	Intel 440FX
2 ISA, 3 PCI, 1 PCI/ISA	3 ISA, 3 PCI	2 ISA, 3 PCI, 1 PCI/ISA	2 ISA, 3 PCI, 1 PCI/ISA	1 ISA, 4 PCI, 1 PCI/ISA	2 ISA, 3 PCI, 1 PCI/ISA	2 ISA, 2 PCI, 1 PCI/ISA	2 ISA, 3 PCI, 1 PCI/ISA	2 ISA, 4 PCI, 1 PCI/ISA	2 ISA, 3 PCI, 1 PCI/ISA
3/2	2/2	2/3	2/3	3/2	3/2	3/1	4/1	3/1	3/1
1/1	0/2	0/1	0/2	0/2	0/1	0/1	0/3	0/1	0/2
145	200	235	200	250	200	204	200	200	200
1/2/2/1	1/1/2/1	1/2/2/1	1/1/2/1	1/2/2/1	1/2/0/1	1/1/2/1	1/2/2/1	1/2/2/1	1/2/2/1
Analog Devices AD1816	Crystal CS4610	Yamaha OPL3- SAX	Yamaha OPL3- SAX	Creative Labs Sound Blaster AWE64	AzTech Labs Sound4 Audio Device/SWT	AzTech Labs Sound4 Audio Device/SWT	Ensoniq Audio PCI	Ensoniq Audio PCI	Yamaha OPL-3X
FM, wavetable	FM	FM	Wavetable	FM, wavetable	Wavetable	Wavetable	FM, wavetable	FM, wavetable	FM
Polk MA3A6	Bose Acousti- mass MM75 with subwoofer	Cambridge Sound- works 04108 with subwoofer	Advent AV009	Bose Acousti- mass MM75 with subwoofer	Packard Bell 7480 with integrated subwoofer	Packard Bell 5480 with integrated subwoofer	Altec Lansing ACS-500 with subwoofer	Altec Lansing ACS-90	Toshiba 1766M with integrated subwoofer
12X-24X Gold- star CDR-8240B	9X Hitachi DVD- ROM GD-2000	9X Hitachi DVD- ROM GD-2000	12X-24X Hitachi CDR-8330	12X-24X Pioneer DR-A24X	12X-24X Gold- star CDR-8240B	12X-24X Gold- star CDR-8240B	9X DVD Toshiba SD-M1002	12X-24X Toshiba XM-6102B	12X-24X Toshiba XM-6102B
None	Iomega Zip 100 Drive	Iomega Zip 100 Drive	Iomega Zip 100 Drive	Iomega Zip 100 Drive	None	None	None	None	None
■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
56.6 / 14.4 (K56flex)	56.6 / 14.4 (K56flex)	56.6 / 14.4 (x2)	56.6 / 14.4 (x2)	56.6 / 14.4 (K56flex)	56.6 / 14.4 (x2)	56.6 / 14.4 (x2)	56.6 / 14.4 (K56flex)	56.6 / 14.4 (K56flex)	56.6 / 14.4 (K56flex)
Syncro Connect Home	Ring Central	None	None	QuickLink	Comm Central	Comm Central	MS Phone	MS Phone	Syncro Connect Home
MS Works 4.0	Lotus SmartSuite	MS Office 97, Small Business	MS Office 97, Small Business	MS Works 4.0	MS Works 4.0	MS Works 4.0	Corel Word- Perfect Suite 7, MS Works 4.0	Corel Word- Perfect Suite 7, MS Works 4.0	MS Works 4.0
Quicken, Special Edition	Quicken, Special Edition	None	None	MS Money	MS Money; Quicken, Special Edition	MS Money; Quicken, Special Edition	MS Money; Quicken, Special Edition	MS Money; Quicken, Special Edition	Quicken, Special Edition
Compton's Interactive Encyclopedia 97	IBM Worldbook Encyclopedia	Compton's Interactive Encyclopedia 97; The Family Doctor, 4th edition	Compton's Interactive Encyclopedia 97; The Family Doctor, 4th edition	MS Encarta 97, The Ultimate Human Body 2.0	MS Encarta 97	MS Encarta 97	Bodyworks 5.0, Compton's Inter- active Encyclope- dia 96, Compton's World Atlas 1997, Home Medical Advisor 6.0	Bodyworks 5.0, Compton's Inter- active Encyclope- dia 96, Compton's World Atlas 1997, Home Medical Advisor 6.0	MS Encarta 97
■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
■	■	■	■	■	■	■	■	■	■
1 year/1 year	1 year/1 year	3 years/1 year	3 years/1 year	3-5 years/ 3 years	1 year/1 year	1 year/1 year	3 years/1 year	3 years/1 year	1 year/1 year
Included	N/A	Included	Included	N/A	\$59.95	\$59.95	Included	Included	Included
■	■	■	■	■	■	■	■	■	■

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PC MAGAZINE
JULY 1997

SERVICE AND RELIABILITY SURVEY

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When it comes to service and reliability, who's the one notebook maker you can truly count on? According to the nearly 8,500 people who responded to *PC Magazine's* 10th Annual Service and Reliability Survey,* there is only one. (Impressive, considering they rated some 3,800 notebooks from 15 vendors, isn't it?) How did we earn the only "A"? Over the last year, our users reported better than average scores on four key measures: satisfaction with reliability, repair experience, and technical support; and the need for recent repairs. And this is a trend we're likely to continue with our new line of Dell[®] Inspiron™ notebooks. Visit us on the Web or give us a call.

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of its Software Solution Paks. You can choose from such Paks as the Home Productivity Pak with Broderbund's Print Shop Ensemble III and Compton's Interactive Encyclopedia 1997; the Quicken Productivity Pak; and the Xcitement Pak, which includes Adobe PhotoDeluxe, Blockbuster Entertainment, and Video Guide and Eraser, among others. You may also purchase additional Paks for \$69 each.

Both PCs come with illustrated documentation and icon-labeled ports. The company offers 24-hour technical support, and its Web site has an extensive library of drivers and documentation.

The XKU is a very appealing high-end system; if you're in the market for a mainstream unit, however, you'll find better choices than the MME.—RSA

Micron Electronics Inc., Nampa, ID; 888-634-8799, 208-893-3343; fax, 208-893-3424; www.micronpc.com. *Circle 448 on reader service card.*

MidWest Micro PRH 266

Pentium II/266, 6.1GB hard disk, 17-inch monitor, SDRAM. Business Winstone 98 score: 20.6. \$3,180 direct.

MidWest Micro's high-end PRH 266 offers game aficionados impressive audio features, a solid software bundle, and competitive performance. The minitower system is aimed at the SOHO, family, and gaming markets.

The unit includes Microsoft's Side-Winder Game Pad and a large software bundle, including the Family Collection,

some 3-D entertainment titles, and three MMX-enabled packages (POD, The Ultimate Human Body, and Eraser Turnabout). It also has a set of Bose Acoustimass speakers with a huge subwoofer and a Creative Labs AWE64 wavetable sound board. This combination yielded fairly good sound on informal testing.

The PRH 266 was an average performer on most of our tests, save for above-average scores on our Business Graphics and CD-ROM WinMark 98 tests—thanks to an ATI3D Rage Pro AGP graphics board and a 24X Pioneer CD-ROM drive. Its 3D WinMark 98 score was very high.

The unit also comes with a 56.6-Kbps K56flex DSVD voice modem and a

100MB Iomega Zip Drive. By the time you read this, MidWest Micro will include a DVD drive standard with the system, which will add \$180 to the above price.

All system ports were labeled, and the manual offers setup and troubleshooting help. Technical support is available during extended business hours on weekdays and from 10:00 to 4:00 (eastern) on Saturdays. Drivers, manuals, and an automated troubleshooting wizard are available on the company's Web site.

For game mavens, the MidWest Micro PRH 266 delivers on its promises.—RSA
MidWest Micro, Fletcher, OH; 800-728-8582, 937-368-0230; fax, 937-368-2306; www.mwmicro.com. *Circle 449 on reader service card.*

Packard Bell NEC Platinum 3000, Multimedia R500

Platinum 3000: Pentium II/233, EDO DRAM, 4.1GB hard disk, 17-inch monitor. Business Winstone 98 score: 18.1. \$2,400 street.

Multimedia R500: MMX Pentium/200, EDO DRAM, 4.1GB hard disk, 15-inch monitor. Business Winstone 98 score: 10.6. \$1,750 street.

Packard Bell NEC, still the industry's leading home PC seller, is long on user-friendly software and short on performance. The home PCs are designed primarily for first-time buyers: They come preloaded with a Windows 95 front end and other utilities to simplify operating systems and Internet usage, but each is burdened by second-tier hardware and low performance.



POLITICALLY CORRECT IN THE 90'S:



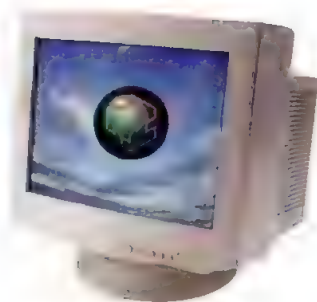
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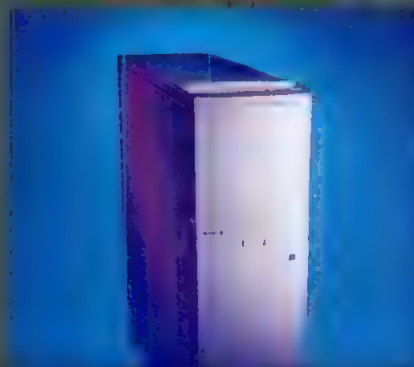
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The two minitowers come preloaded with the same, home-specific software configuration. CyberTrio is a simple Windows 95 front end with three separate interface options: The Kiddos screen is a colorful interface that offers access only to those programs predefined by parents; the Basic screen resembles everyday Windows 95 but prevents new users from deleting important program files or DLLs; and the Advanced screen is merely straight Windows 95. Planet Oasis, a separate front end, is provided for Web and e-mail use.

Packard Bell's Navigator Assistant is akin to the fuller front ends that were in vogue during the age of Windows 3.1 (Dashboard, TabWorks, and so on). This strip of on-screen icons affords quick access to the Internet (including two months of free access via Prodigy), a CD player, Comm Central speakerphone and fax software, and system preference settings. Packard-Bell also preloads its Support Center, which includes user's guides, tutorials, answers to FAQs, and SystemSoft's SystemWizard (a GUI used to diagnose and solve specific problems). The units also bundle packages such as Microsoft Word and Encarta, and finance software.

The Platinum 3000 ships with Intel's Video Phone with ProShare technology but does not include a video camera. The unit does include an enhanced graphics card, which offers video capture and video out-ports, and a multimedia keyboard, which integrates volume, mute, CD access,

and speakerphone buttons. The rest of its hardware features—processor and monitor size aside—match those of the Multimedia R500. But the Platinum 3000, ostensibly a high-end machine, is the only unit in our roundup that lacks USB ports (the company says they will be added shortly).

Both PCs use an Aztech card that acts as both 56.6-Kbps telephony modem and audio subsystem, and each monitor integrates two stereo speakers and a subwoofer. Not only were these sound systems among the poorest we found on informal testing, but you'll need a screwdriver to adjust the subwoofer's bass levels.

Running at second-tier clock speeds and using older chip sets, the Multimedia R500

and the Platinum 3000 garnered some of the lowest Business Winstone 98 scores in their respective categories. The Multimedia R500 also suffers because it has no L2 cache. Its GoldStar 24X CD-ROM drive performed well on our CD-ROM WinMark 98 test; all other scores were average to below average for both systems.

Each unit has a one-year warranty with 90 days of on-site service. Packard-Bell has put much effort into its software, but it has certainly cut costs on hardware.—CM

Packard Bell NEC Inc., Sacramento, CA; 800-733-5858; www.packardbell.com. Circle 451 on reader service card.

Quantex QP6/266 M-4X, Quantex QP5/233 M-3



QP6/266 M-4X: Pentium II/266, EDO DRAM, 4.1GB hard disk, 17-inch monitor. Business Winstone 98 score: 17.0. \$2,799 direct.

QP5/233 M-3: Pentium MMX/233, EDO DRAM, 3.1GB hard disk, 17-inch monitor. Business Winstone 98 score: 16.2. \$1,799 direct.

Quantex Microsystems' QP5/233 M-3, the Editors' Choice winner in our mainstream category, offers a generous and practical software bundle, crisp sound, and good Pentium-level performance for under \$2,000. The QP6/266 M-4X affords even better sound as well as a DVD drive, but its graphics performance was poor relative to other high-end machines reviewed here.

Each of these systems is a minitower



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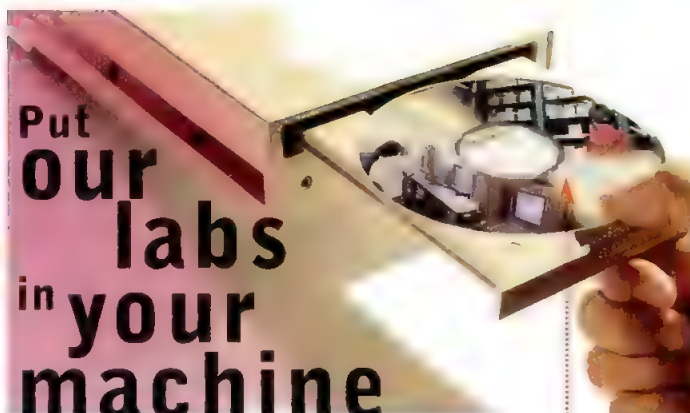
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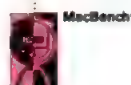
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model with a tool-free chassis. Each includes a 56.6-Kbps telephony modem with answering machine and full-duplex speakerphone capabilities, an Ensoniq PCI wavetable board, and an STB Nitro 3D graphics card (with 4MB of SGRAM).

In the case of the QP6/266 M-4X, the STB card led to the lowest Business Graphics WinMark 98, 3D WinMark 98, and Business Winstone 98 scores in our high-end category. But the same card earned an above-average score on our Business Graphics WinMark 98 test for the QP5/233 M-3 in the mainstream category. The QP5/233 M-3's other scores were average. The QP6/266 M-4X had another below-average rating on our CD-ROM WinMark 98 test, but such is to be expected from a first-generation DVD drive. The system's DVD decoder card, a PCI device, affords S-Video and Composite video out-ports.

The chief strength of these units is audio. The Ensoniq PCI card is accompanied, in both cases, by an Altec Lansing speaker solution. The QP5/233 M-3's mid-size speakers were leading mainstream performers during our informal sound testing, whereas the QP6/266 M-4X, equipped with 2-foot-tall speakers and a massive subwoofer, was a leader among high-end units.

The Quantex software bundle, available with both machines, is among the best of the roundup. The company surrounds the Corel WordPerfect Suite 7 with American Heritage Talking Dictionary, Compton's Interactive Encyclopedia, Home Medical Adviser, Microsoft Money, and Quicken SE. A small, unobtrusive Welcome interface stores technical numbers and answers to common questions. Technical support is available around the clock, and Quantex provides three years of parts and a year of labor coverage.

Although the two units are not designed from the ground up to be true home PCs, their sound systems and software bundles alone make for worthwhile home purchases. The QP6/266 M-4X's DVD drive is also an attractive home peripheral, and Quantex will soon ship systems with a second-generation drive and Altec Lansing's six-piece 80A600 speaker ensemble.—CM

Quantex Microsystems Inc., Somerset, NJ; 800-346-6572, 732-563-4166; fax, 732-563-0407; www.quantex.com. **Circle 452 on reader service card.**



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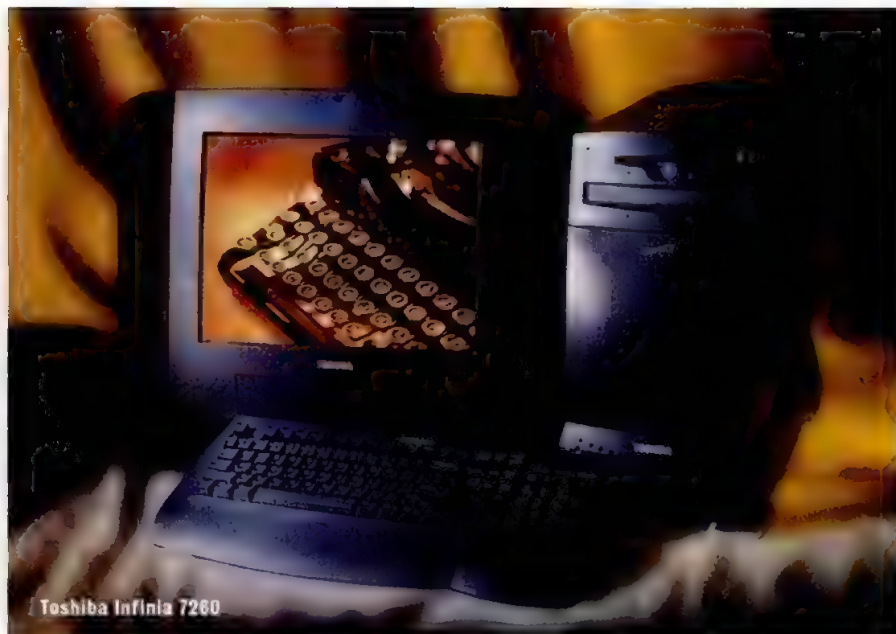
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Toshiba Infinia 7260



Pentium II/266, EDO DRAM,
6.2GB hard disk, 17-inch monitor.
Business Winstone 98 score: 20.8.
\$3,400 street.

Toshiba America Information Systems offers a range of configurations for different home applications. The Infinia 7260, one of our Editors' Choice winners, is that company's high-performance model, targeted for a wide range of family applications and stressing functionality and ease of use. A very well-designed product, the Infinia 7260 meets both its performance and usability goals.

This unit doesn't currently include a DVD drive. Toshiba offers DVD drives with some other Infinia models, such as the Pentium MMX/233-based 7231, a midrange system that sells for \$3,300, with equipment comparable to that of the 7260.

The Infinia design features we appreciated in the past, such as the InTouch Module, are still present here. The InTouch Module is built into the monitor; it can be activated by a remote control and features a big-button volume control. The module has ten control buttons in addition to the volume, dial, and sleep buttons. The lower five buttons let you select between speakerphone, answering machine, CD player, television, and FM stereo, with the upper five used to control the selected function. Master volume con-

trols for the mounted speakers and the subwoofer are out of sight behind the left side of the monitor.

The Infinia 7260 achieves its performance goals, posting above-average scores on our Business Graphics WinMark 98 test—thanks to its 4MB PCI ATI 3D Rage Pro graphics videoboard—and on our CD-ROM WinMark 98 test—thanks to its Toshiba XM-6102B CD-ROM drive. Its 3D WinMark 98 score was also very high; other scores were average. On audio jury testing, the unit's sound was fairly good for audio CDs, but not as good for MIDI files.

A raft of software is bundled with the Infinia 7260, including Microsoft home productivity and entertainment titles, Mayo Clinic Family Health, Quicken SE, and several game titles. It's backed by a one-year warranty, with 24-hour, seven-day technical support. On-site service is included for 90 days. Toshiba's desktop systems appeared for the first time in *PC Magazine's* Service and Reliability Survey this year; they did fairly well, earning mostly average scores with one above-average rating.

The InTouch Module is the key to the Infinia 7260's success. Easy access to system entertainment and communications features make this product the most family-friendly PC in our roundup.—*BB*
Toshiba America Information Systems Inc., Irvine, CA; 800-334-3445; www.toshiba.com. Circle 453 on reader service card. **PC**

The official HP PhotoSmart System Contest grand prize suggestion list:

- 1) Lifetime supply
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of glamour length
press-on nails.
- 2) Romantic weekend
getaway to Newark,
REJECTED
New Jersey.
- ✓ 3) The HP PhotoSmart
system.



How would you use the HP PhotoSmart system to change your favorite photo? When you tell us, you just might win the means to alter your own real photos. Prize includes printer, scanner, digital camera and Microsoft® PictureIt! software. Just send a self-addressed stamped envelope to: HP PhotoSmart Contest - Entry & Rules - c/o (Publication Name), PO Box 9273, Medford, NY 11763-9273 for an entry form and a complete set of rules OR visit the website: www.hp.com/go/PhotoSmart.

Contest starts December 1, 1997 - must have entries by February 27, 1998. No purchase necessary. Void where prohibited and in MD, VT and PR. This HP contest is being co-sponsored by this publication.

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Image

By Sally Wiener Grotta and Daniel Grotta

Photography, for decades the world's number-one hobby, has found a new focus: your PC. This development is the result of new technology that makes professional-level imaging affordable and easy. Digital cameras and scanners are cheaper and better than ever. Inexpensive desktop printers are now capable of output that rivals the quality of the prints you get from processing services. And even entry-level PCs have enough power to handle relatively sophisticated image editing. What pulls everything together is the software.

The products in this relatively young category are designed to help you clean up images and use them with a variety of *projects*—enhanced templates or wizards for creating finished works. Typical features include

red-eye reduction, color, brightness and contrast adjustments, and controls to add brushstrokes, text, and special effects. The projects are generally geared to families and SOHO users and include greeting cards, brochures, and business cards.

The nine programs we reviewed each have a street price of \$100 or less, yet most offer surprisingly powerful tools couched in a friendly interface. Because home image editing is such a new market, we saw a lot of variation in features and capabilities. Nevertheless, certain trends were apparent. Many programs offer step-by-step instructions to guide you through the creative process. These include Adobe PhotoDeluxe 2.0, Corel Print House Magic, The LivePix Co.'s LivePix, Microsoft Pic-



Sorry, no software can turn your kids into model children. But image-editing packages can do amazing things with your pictures. As more families discover the advantages of digital photography, a new class of software has emerged to help consumers transform their images into works of art.

Photography has gone digital. Once you've got your pictures into a PC, these easy-to-use image editors will help you put your best foot forward.

Visit www.pcmag.com for more reviews of PC-photography products, as well as information on the new online services for processing and transmitting images.

ture It! 2.0, and Micrografx's Windows Draw 6. The others—PictureWorks Technology's HotShots, MetaCreations Corp.'s Kai's Photo Soap, MGI Software Corp.'s MGI PhotoSuite 8.5, and The Learning Company's PhotoFinish 4—tend to be more freewheeling.

One of the key areas for consumer software is interface design, and image-editing programs have made major strides there. Though a couple (PhotoSuite and PhotoFinish) stick to the traditional Microsoft Windows look, others such as Adobe PhotoDeluxe, HotShots, LivePix, Microsoft Picture It!, and Photo Soap go their own way with innovative interfaces. Two programs, Corel Print House Magic and Windows Draw, are actually suites.

Despite low prices and friendly exteriors, these programs boast some sophisticated technology. Adobe PhotoDeluxe, for example, is based on core technology used in Adobe Photo-

shop. And LivePix and Microsoft Picture It! include full support for FlashPix, an emerging standard that allows the user to work with large, high-resolution files without having to buy a supercomputer. In essence, what all these image editing programs do is make image-editing capabilities once reserved for the pros more accessible to a wide audience.

Before you can begin working with images on your PC, you have to get them in a digital format. Fortunately,

the options are numerous. (For more information, see the sidebar "The Ins of Digital Imaging.") You can use a digital camera to capture all your photos and transfer them directly to your PC. If you shoot with film, you can use a scanner to digitize your prints. Or you can get digitized pictures from your local minilab on a PhotoCD, a floppy disk, or over the Internet via PhotoNet, Kodak Picture Network, or similar services.

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SUITABILITY TO TASK:

image-
editing
software



	Adobe PhotoDeluxe 2.0	Coral Print House Magic 3.0	HotShots	Kal's Photo Soap	LivePix 1.1	MGI PhotoSuite 8.5	Microsoft Picture It! 2.0
POWER							
Image editing and correction	Good	Excellent	Good	Good	Poor	Poor	Good
Collaging	Good	Excellent	Poor	N/A	Good	Poor	Excellent
Projects	Good	Good	Poor	Fair	Good	Poor	Excellent
Input, output, and save	Good	Good	Good	Poor	Fair	Good	Excellent
EASE OF USE							
Image editing and correction	Excellent	Good	Good	Fair	Good	Fair	Excellent
Collaging	Excellent	Good	Fair	N/A	Good	Poor	Good
Projects	Good	Good	Fair	Good	Good	Fair	Excellent
Input, output, and save	Good	Good	Good	Fair	Good	Good	Excellent

N/A—Not applicable. The product does not have this feature.

Image editing and correction We look at how each product enables a user to enhance or change an image, including red-eye removal, exposure and color correction, healing, focus correction, cloning, painting, and special effects. We consider whether an application allows the user to preview each feature and how easily the function can be applied.

Collaging Combining photos with textures, graphics, and other photos is a popular feature of image-editing programs. We evaluate each application's masking and selection tools; cut-out tools; drop shadow, color transparency, and text tools; and the usability of layers or objects within the collage.

Projects Projects and wizards guide the user through the

steps of creating cards, calendars, T-shirt transfers, magazine covers, and other handicrafts and fun items. Projects should be quick, diverse, and easy to use. They should also offer advice along the way, allow editing, and of course provide good results.

Input, output, and save We rate each program's support for file formats, Twain, and plug-ins, as well as its ability to ac-

At the very least, your photo-editing program should be able to read a PhotoCD; the more advanced programs have push-button links for acquiring photos over the Internet. If you are downloading pictures from the Web that aren't your own, be sure you have the right to use them. Parents should be aware that an unrestricted search for photos on the Internet can yield links to adult collections. (We did a search on the word HotShots from within the program to find other users, and we received a list that included links to a whole different sort of "hot shots.")

Once you've transferred the images to your PC, you'll want to organize them efficiently. Many image-editing programs include albums—simple databases where you can store and browse through images. Some can import images directly from a digital camera. In case the program you choose does not have an album, there are several standalone albums to choose from. (For more information, see the sidebar "Get the Picture.")

A consumer image-editing program should help make your images look their best. It also should allow you to be creative, producing effects and projects that put the pictures in a whole new light. Typical tools include those for color balance,

brightness, contrast, and specific items such as red-eye reduction. Special-effects filters can completely alter the look of your image, with results ranging from the beautiful to the downright bizarre. Paint brushes and collaging tools allow you to try your own hand at photo composition.

Once you've got the image looking the way you want, you may wish to use it in a project. All of these programs but PhotoFinish include ready-made projects. The better programs walk you through customizing the projects step by step.

As with input, snapshot and near-photo-quality ink jet printers can now produce images that look nearly as good as what you get from a processing service. (See the sidebar "The Outs of Digital Imaging.") And a number of the programs we tested let you send images and documents via e-mail or upload them for professional processing.

Digital imaging adds a whole new dimension to photography. There's something enchanting about watching your images enhanced or transformed before your eyes. But the real beauty of these image-editing packages is that they make all this as simple as your point-and-shoot camera. So say cheese.

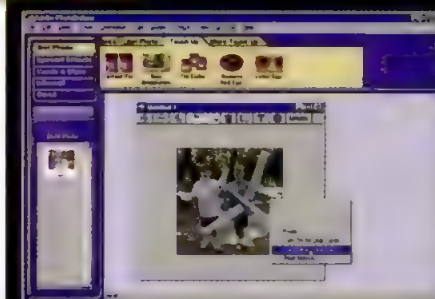
Adobe Systems Inc.

Adobe PhotoDeluxe

Hidden behind the consumer-level Adobe PhotoDeluxe 2.0 (\$50 street) is the same state-of-the-art technology found in Adobe's professional-level Photoshop. The difference is that PhotoDeluxe's interface holds your hand every step of the way, from getting images into your PC to printing completed projects. But some shortcomings, including

Adobe PhotoDeluxe

We began with a photograph taken by a digital camera and imported via PhotoDeluxe's Twain interface. The preset variations on the Fix Color



touch-up tool made the original image worse, so we used the sliders on the advanced-level Color/Balance tool to brighten the image, then

Editors' Choice

• Microsoft Picture It! 2.0



For this story on consumer-level image editing, our primary focus was on usability. Of course, a good graphics program must also offer the power to achieve

the look that you're after. Microsoft Picture It! 2.0 gracefully combines the best of both worlds, bringing the power of image editing to a broader audience and earning our Editors' Choice.

Although only in its second version, Picture It! looks and feels like a mature application. The program uses the step-by-step approach to image editing that has become popular in this category. When the mouse pointer hovers over toolbar icons, pop-up menus provide additional commands, as well as illustrations and descriptions of each tool. When you select a tool, the program automatically displays a step-by-step guide to using it. These ease-of-use features allow even novices to start working with images immediately.

Picture It!'s well-rounded collection of tools includes red-eye reduction, color correction, special effects, paint

brushes, collaging, and robust text handling. The projects, including greeting cards, calendars, certificates, trading cards, business cards, and stickers, can be customized easily. Rather than just transferring your images to a ready-made project, Picture It! also gives you the option of adding a project, or even a part of a project, to your existing work. Once you've put the finishing touches on, you can print your project using an online processing service, e-mail it as an executable file, or build a slide show.

Although we preferred a single application for this audience, the two suites in this roundup, Corel Print House Magic and Micrografx's Windows Draw 6, deserve an honorable mention. With their surprisingly powerful toolsets and huge collections of projects and clip art, each is an excellent value.

to wizards for tools such as brushes and erasers and to a variety of Photoshop filters with preset options for subtle effects such as glowing outlines. You can add saved images to an integrated version of Storm's EasyPhoto album software.

Selection tools include a magic wand and a "smart" lasso that snaps to nearby outlines. You can apply text to images, but you can't apply special effects to text unless you save and reopen your image in PhotoDeluxe 1.0 format. A well-designed layers palette provides precise control over the image layers used for

all selections or pasted-in images. Layers allow you to work on individual images, brush strokes, or effects in a composition without affecting the rest of the project. The drawing, erasing, and cloning tools are limited to round shapes in preset sizes and transparencies.

PhotoDeluxe makes common tasks—fixing red eye or "antiquing" and repairing scanned images—effortless, and special effects are designed with subtlety and skill. But some dialog boxes have been oversimplified. For example, the color balance tool displays six thumbnail buttons with simple labels like "More Green" and "More Cyan," but if you want to subtract cyan after adding it, you have to cancel all your changes and start over.

Our Contributors: SALLY WIENER GROTTA, DANIEL GROTTA, LORI GRUNIN, and EDWARD MENDELSON are contributing editors at *PC Magazine*. DIANE JECKER was the project leader, and JOHN MORRIS was the associate editor in charge of this story.

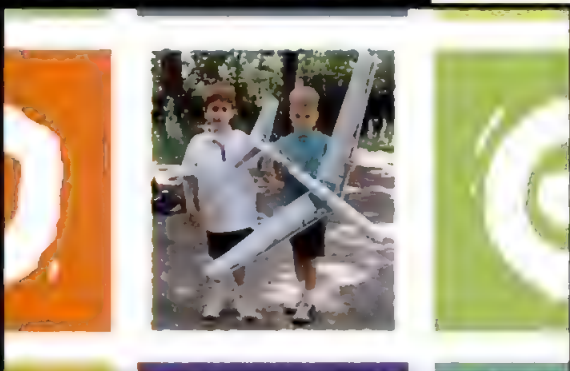


PhotoFinish 4	Windows Draw 6
Fair	Excellent
Poor	Good
N/A	Excellent
Poor	Excellent
Fair	Good
Fair	Good
N/A	Excellent
Fair	Good

cept images from a file, scanner, or digital camera. This category also includes the program's flexibility in printing options, including printing contact sheets and various layouts. We include the organization and cataloging of saved images here, in addition to the product's Web integration and additional online services such as Kodak Picture Network or PhotoNet

only one level of undo, tarnish the package's overall performance.

PhotoDeluxe's tabs and pop-up "clues" guide you through each stage of importing, repairing, and enhancing an image. The program offers additional step-by-step dialogs to help you insert images into projects. After opening an image, you can click on touch-up tabs that walk you through the steps of correcting color balance, removing red eye, and making other changes. A set of special-effects tabs lead



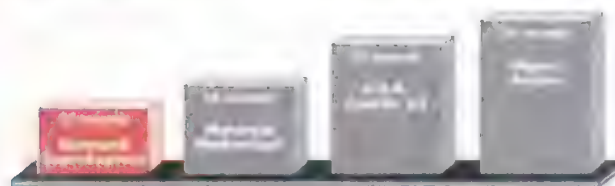
we used the Canvas Size dialog to add a white border, selected the picture, and used the Feather tool to give it an uneven edge. We then used the Cards wizard to select a predesigned card and let the program automatically import the image into the card to create the finished product.



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Taking the Middle Road

The evolution of PC photography has given rise to a new class of software that guides users through the process step by step. But inexpensive image-editing packages were around long before PC photography. Today, many of these packages occupy a middle ground between consumer products such as Microsoft Picture It! and more expensive professional packages. We looked at four popular packages in this niche.

Concentrating on the basics of image retouching and editing, **ArcSoft PhotoStudio** (\$90 street) has a traditional feature set. For instance, it provides tools you rarely see anymore in low-cost products, including traditional compositing (where you select a second file to combine with the current image via an operation such as Add or Difference) and a broad range of color separation schemes.

PhotoStudio also has an album that generates thumbnails faster than any product we've seen. But you can't drag and drop the images from the album into your workspace. Similarly, PhotoStudio provides a decent if unremarkable selection of artistic, distortion, and tiling special effects. It's not likely to win any design awards, but PhotoStudio's solid selection of tools make it a low-priced version of Photoshop. (ArcSoft Inc., Fremont, CA; 800-762-8657; www.arcsoft.com. *Circle 470 on reader service card.*)

A veteran of the imaging arena, **HiJaak Graphics Suite 95** (\$50 street) has passed through many vendors' hands. In its current incarnation, the suite consists of six applications: the format converter, a screen capture utility, a scanner utility, a paint program, a drawing package, and a media manager.

Perhaps the most intriguing component of the group is the HiJaak Cata-

log, which adds extensions to Windows Explorer that allow Explorer to display image thumbnails. It updates these thumbnails, for user-selected directories, either on demand or in the background.

The other elements are mostly basic. For example, the screen-capture utility offers fewer area-capture options than those in Ulead's Photo-

a traditional channel operations interface, but it offers you control over a few extra parameters. The filter and deformation browsers let you quickly scroll through thumbnail previews of various effects. PSP is the type of product that you download when you need it and wind up keeping it in your toolkit because it gets the job done. (JASC Inc., Minnetonka, MN; 800-622-2793, www.jasc.com. *Circle 472 on reader service card.*)

The priciest of these products—and those in the main story—Ulead's **PhotoImpact with WebExtensions 3.0** (\$99.95 list) offers some bang for the extra bucks. Like HiJaak Graphics Suite 95, PhotoImpact is a suite that includes a core image editor, Album, Capture, Explorer, and Viewer. The WebExtensions are a set of add-on utilities that integrate into the program's interface and

include the surprisingly powerful GIF Animator and GIF/JPEG SmartSaver.

The image editor offers all the essential tools, such as tone-map editing, color-balance adjustment, and special effects, but its real strength lies in its more high-end capabilities. For instance, it not only supplies multiple levels of undo, it allows you to pick the point from which to undo changes.

The product's EasyPalette is a great interface for dragging and dropping predefined effects onto the current image, and it works with the excellent gradient-design tools. When combined with features such as the Button Designer and Background Designer, it really becomes a Web-designer's companion. (Ulead Systems Inc., Torrance, CA; 800-858-5323, www.ulead.com. *Circle 473 on reader service card.*)—LG



In HiJaak Graphics Suite 95, you can do more with filters than you ever thought possible.

Impact, and the scanner utility is a simple interface for Twain drivers. But HiJaak Paint also provides Photoshop-level features in some places. HiJaak Graphics Suite offers a good range of features but lacks the depth of other midrange programs. (IMSI Inc., San Rafael, CA; 415-257-3000; www.imsisoft.com. *Circle 471 on reader service card.*)

It started life as a shareware product, but thanks to a devoted following, JASC's **\$69 Paint Shop Pro (PSP)** has evolved into a hybrid shareware/retail application. You can still download a trial version.

PSP offers all the basics—selections, special effects, tonal correction tools—in a straightforward interface, plus a serviceable built-in screen capture utility and batch file-conversion command. Like PhotoStudio, it allows you to combine two images via

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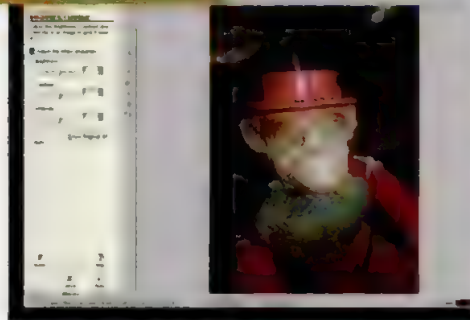
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Corel Print House Magic

After choosing a sample monthly calendar design from Print House's abundant selection and specifying a month, we returned to the Guided Activities panel to select the image object and delete it. Once we imported our own image, we chose Change Image under the Guided Activities panel, which launched the Photo House module via OLE and loaded the new image. In Photo House, we used the manual sliders to adjust the brightness, contrast, and intensity, after which we applied a vignette effect to block out the background elements. These tools are available from Photo House's Guides tab. We then returned to Print House and enlarged the text (via the text tool ribbon), and thickened the lines of the calendar cells.

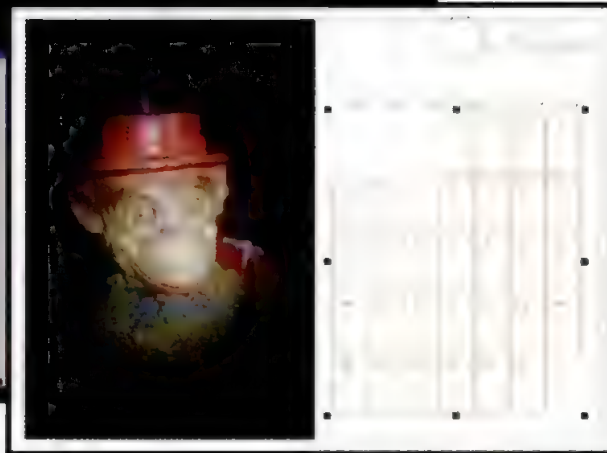


And the dialog doesn't give any hint that you can refine color balance more precisely using sliders accessible from the program's main menu. One of PhotoDeluxe's biggest drawbacks is the single level of undo, which discourages experimentation.

In PhotoDeluxe, you select a project from a tabbed interface that gives you a choice of calendars, greeting cards, business cards, labels, photo album pages, signs, magazine covers, certificates, and more. PhotoDeluxe opens and saves images in all standard formats, including FlashPix, but when it e-mails an image via Windows Messaging, it uses a proprietary format that can only be read by PhotoDeluxe and Photoshop users. The program tells you how to paste a GIF or JPEG file into e-mail, but it won't do the actual job for you.

Of the products in this roundup, PhotoDeluxe is undeniably one of the most powerful, and its step-by-step interface is ideal for graphics novices. But program inconsistencies mar an otherwise impressive product.—*Edward Mendelson*

Adobe PhotoDeluxe 2.0. Street price: \$50. Requires: 486-based PC or better; 16MB RAM, 70MB hard disk space, Microsoft Windows 95 or NT 4.0. Adobe Systems Inc., San Jose, CA; 800-272-3623, 408-536-6000; fax, 408-537-6000; www.adobe.com. Circle 461 on reader service card.



Corel Corp.

Corel Print House Magic

A suite of three tools, Corel Print House Magic 3.0 (\$40 street) offers the same features that other products merge into a single application, plus a little extra. In addition to Photo House 2 for image retouching and editing and Print House 3 for collaging, Print House Magic includes a basic personal information manager called Family and Friends, which we did not test for this review. Print House Magic lacks the seamless integration of Picture It! But it's otherwise a powerful and easy-to-use product for the intermediate user.

The Print House and Photo House modules have similar interfaces: They both offer the same guided-activities panel on the left side of the screen as Picture It! Though its interface is hardly unique—the program sticks to a standard Windows look unlike products such as HotShots and Kai's Photo Soap—Print House Magic boasts a broader feature set than most of the products in the roundup.

The program offers Wrappers (similar to the Envelopes in CorelDraw) that provide an easy way to reshape an object by moving points on a box around the object's perimeter, a Symbol Sprayer (for drawing with text), a Table tool, and a Shaper (curve editing) tool. Photo House supports Photo-

shop plug-ins and includes Auto F/X edges. These third-party add-ons allow you to create high-end effects. But what Print House Magic lacks is an image catalog, so you'll need a separate utility to use that. (For more information, see the sidebar "Get the Picture.")

For every tool, Corel provides control over enough parameters to make even power users happy. Unfortunately, the advanced features are not as well camouflaged as they should for beginners. For example, in many cases Photo House directs you to change the *threshold value*—hardly an easy concept for those just getting started with graphics. The threshold refers to the range of settings for brightness, contrast, and so on.

The ability to view a real-time preview and toggle between that and the original lets you experiment freely. While the toolset is impressive, in some cases the results were not. The red-eye reduction feature, for example, was difficult to apply properly. For best results, you must select a specific area and perform the red-eye reduction only on that selection—a procedure many users may have trouble figuring out. And even when we selected the area, the results were not very realistic.

In order to take full advantage of some features, such as wrapper shapes, you'll need to know how drawing programs work. Corel offers a large selection of sample projects (and it offers more on its Web site), but in our opinion, neither they nor the sample photos are very attractive.

Print House Magic should appeal to users who are comfortable working with suites and who want a program with room to grow. But those who just want good, quick-and-dirty retouching and collaging should look elsewhere.—*Lori Grunin*

Corel Print House Magic 3.0. Street price: \$40. Requires: 486-based PC, 8MB RAM, 30MB hard disk space, Microsoft Windows 95 or Windows NT 4.0. Corel Corp., Ottawa, Ontario, Canada; 800-772-6735, 613-728-0826; fax, 613-761-9176; www.corel.com. Circle 462 on reader service card.

9:23 a.m.

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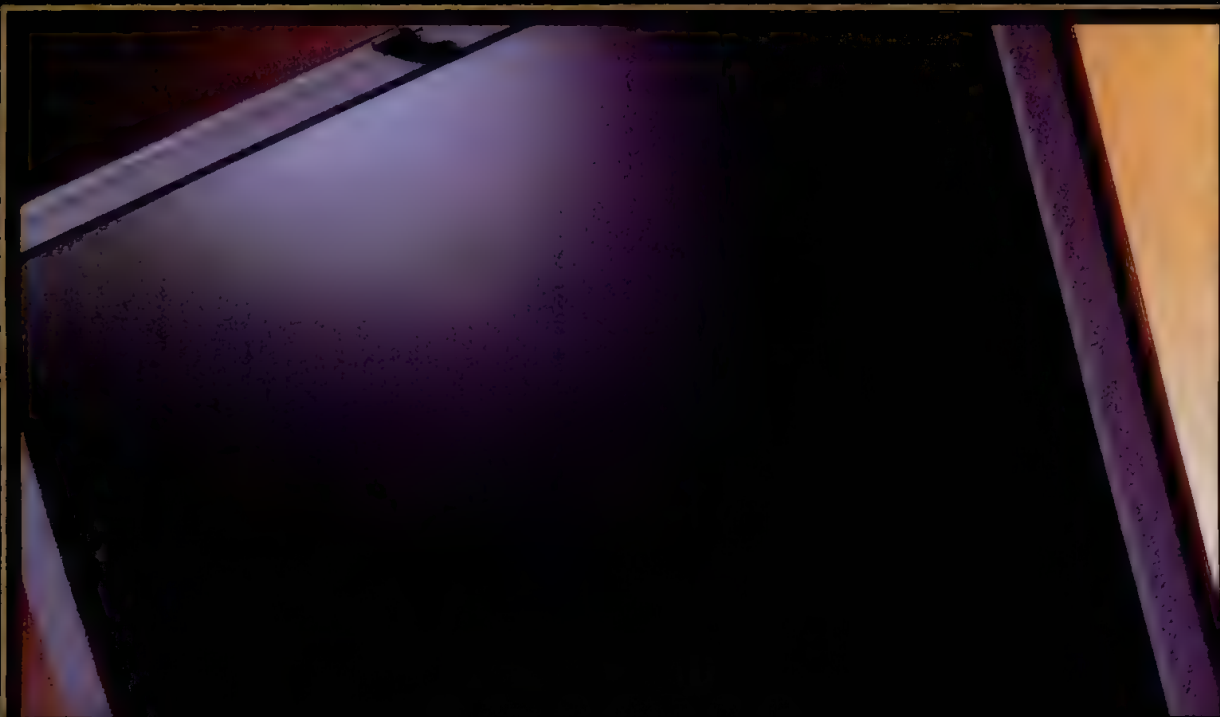
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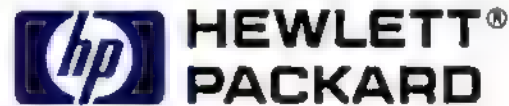
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The Ins of Digital Imaging

efore you can work with digital images, you first have to get them into your PC. Fortunately, there are a variety of ways to do this, from digital cameras to snapshot scanners, color flatbed scanners, and film scanners. Although each has its advantages and limitations, they all allow you to capture digital images in an easy, fast, and inexpensive manner. Most of these products connect to the PC through a Twain interface, which means you can capture images and bring them directly into the programs reviewed in the main part of our story.

DIGITAL CAMERAS

Think of a Polaroid camera with an attached computer and you get the idea of what a digital camera is and does. Just point, shoot, and voilà! your image is instantly captured on a memory card or chip. Within seconds, you can shoot again. If the subject blinked or moved, you can delete the spoiled image.

Although they don't kick out finished prints like a Polaroid camera, most digital cameras provide immediate visual feedback on a built-in LCD. The LCD can also double as a through-the-lens preview and a viewfinder, an essential feature for close-ups. Other cameras have optical viewfinders—a useful feature because LCDs are difficult to see in bright light. A few models offer both.

Depending on the camera, memory capacity, and degree of compression selected, you'll be able to shoot anywhere from 2 to 192 pictures. When you're ready to transfer pictures to your computer, you attach the camera to a serial or parallel port, pop the memory card into a PC Card reader, or line up the infrared interface with your laptop IrDA port. Depending on the camera, image size, and software, it takes 10 to 50 seconds to download each image.

The three things manufacturers focus on in their products to distinguish them from the competition are resolution, lens, and features. Resolution refers to the amount of detail (number

of pixels) in a picture. Generally, the more pixels, the sharper the image. The resolution of digital cameras ranges from 320-by-240 to 1,280-by-1,000. Nowadays, the majority of digital cameras support 640-by-480 resolution.

Lens quality is just as important as resolution. The average inexpensive digital camera comes with a fixed-focus, fixed-focal-length plastic lens. Plastic lenses are usually inferior to more expensive glass lenses; auto-focus is better than fixed focus; and zoom lenses are more versatile than fixed-focal-length lenses. Many lenses are equipped for macro or close-up capability.

Other common digital camera features include built-in electronic flash, macro capability, and a video-out port for displaying images on a TV set. Some

n't have a flash, and it requires manual aperture adjustment, but it has an excellent fixed-focus glass lens and removable memory and offers an optional adapter for reading its memory cards in a standard floppy disk drive. The D-220L also has a high-quality glass lens, video-out port, removable memory, and both optical and LCD viewfinders.

The Olympus D320L (\$699 list), Kodak DC120 (\$799 list), and Epson PhotoPC 600 (\$799 list) are the first entry-level digital cameras with megapixel resolution (1,024-by-768 or higher). The DC120 comes with an auto-focus 3X-zoom lens; the Epson and Olympus models come with auto-focus, fixed-focal-length lenses. The Olympus camera can interface directly with snapshot-size color printers.



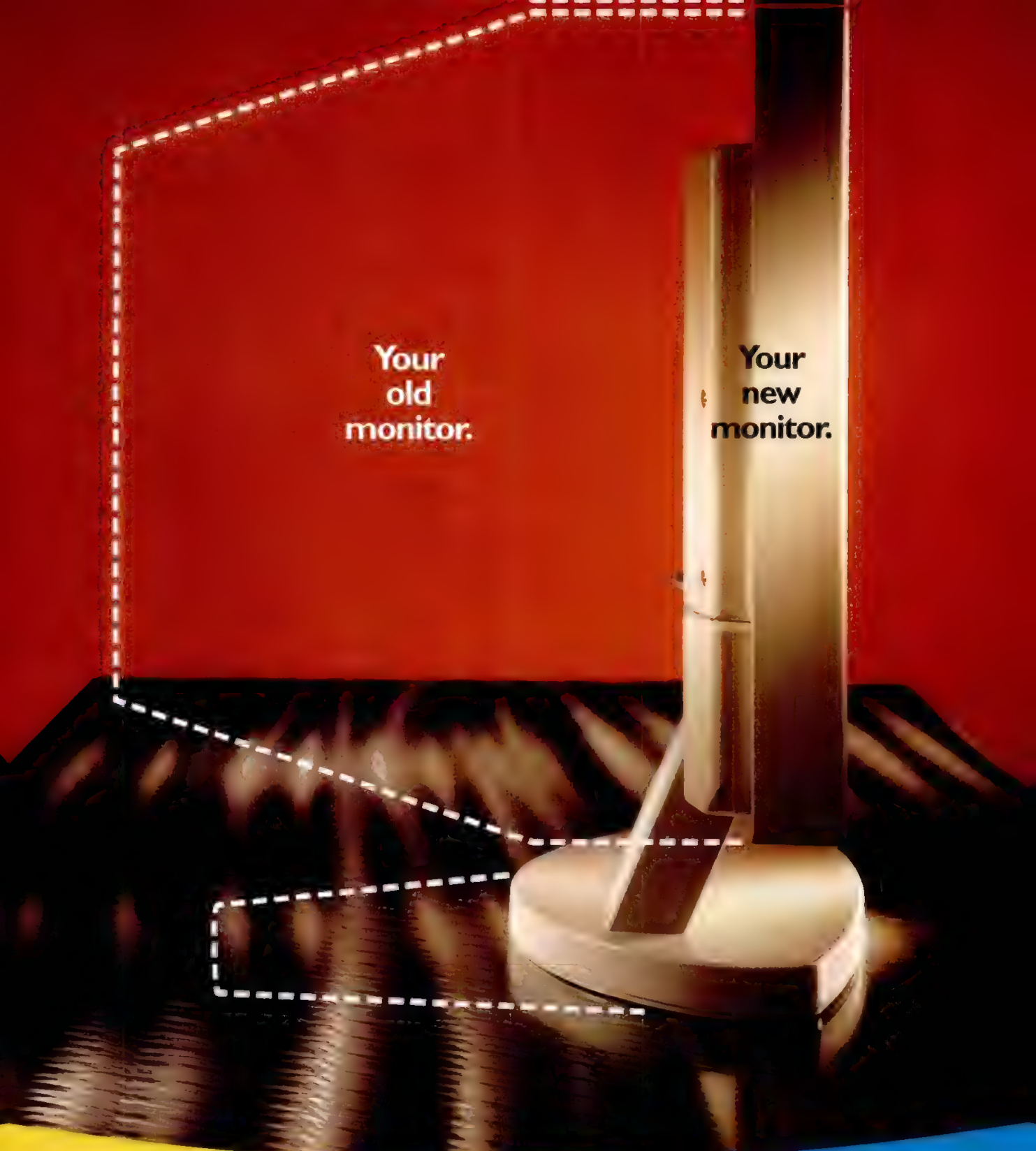
Options for inputting images are numerous. Clockwise from left: the Kodak Snapshot Photo Scanner 1, Visioneer PaperPort 6000, Epson PhotoPlus, and Nikon CoolPix 3000.

cameras offer extras such as voice annotation, wireless infrared interface, a wireless remote control, and the ability to connect directly to a printer.

If price is critical, check out the Kodak DC20 (\$159 list) or the Vivitar ViviCam 2000 (\$199 list). Both cameras are no-frills models without flash, LCD, or removable memory, and each has less than 640-by-480 resolution. The next step up is a 640-by-480 camera like the Fujifilm DX-5 (\$399 list) or the Olympus D-220L (\$499 list). The DX-5 does-

Three unusual digital cameras that may appeal to certain users are the Canon PowerShot 600 (\$699 list), Sony Digital Mavica (\$599 list; \$799 with zoom lens), and Nikon CoolPix 300 (\$699 list). The PowerShot 600 has a glass lens, 832-by-608 resolution, and a gray-scale macro mode for shooting documents (with OCR software, you can import images as text). It's the only camera in its class that can be outfitted with an optional Type III 170MB hard

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disk for storing as many as 3,000 shots without reloading. The Mavica and the CoolPix both have 640-by-480 resolution, an oversize LCD viewer, and a video-out port.

The Mavica is unique because it saves images on standard 3.5-inch disks. The CoolPix is a hybrid camera and PDA (personal digital assistant) that allows users to attach handwritten annotations to images. Both cameras yield excellent images.

SNAPSHOT SCANNERS

Digital cameras are great for capturing new images, but what if you have drawers or shoe boxes filled with snapshots? Snapshot scanner are specifically designed for getting existing photographs into your PC. Snapshot scanners attach to your computer's parallel port, using a pass-through connector so you can also plug in your printer. These devices do not have an on/off switch. Instead, when you place a print in the scanning path, your PC automatically wakes up the device and it begins scanning. You can select resolutions ranging from 100 to 400 ppi (pixels per inch).

Epson, Hewlett-Packard, Kodak, Polaroid, and Storm market snapshot scanners ranging in price from about \$125 to \$400. Unless you plan to scan snapshots and nothing else, or you are very cramped for desktop space, you're probably better off with an inexpensive color flatbed or sheetfed scanner.

FLATBED SCANNERS

Here's why you will want a flatbed scanner: It can handle a variety of original sizes, not just snapshots. Besides photos, you can scan text, drawings, or any other originals. Most flatbeds are parallel-port, plug-and-play devices with virtually foolproof installation and setup. Best, many of these once-expensive devices now sell for \$99 to \$299 with bundled software. (For more information, see *First Looks*, November 4, 1997.)

Most current flatbed scanners are not much larger than a legal-size sheet of paper, though most can scan

only up to approximately letter-size (8.5- by 12.7-inch) originals. Depending on the manufacturer and model, flatbed scanners have resolutions of 300 by 300, 300 by 600, 600 by 600, or 600 by 1,200 ppi. (Incidentally, forget about those ultra-high-resolution numbers bandied about. They refer to software-enhanced or *interpolated* resolution, not optical resolution. In most cases, interpolation does not significantly improve image quality.)

At \$99, the Info Peripherals ImageReader ISA is an outstanding bargain. It comes with an easy-to-install interface board, a great Twain driver, and an impressive bundle of software. If you want faster scan times, slightly better-looking scans, and just about the best scanning software anywhere, consider the Visioneer PaperPort 6000 (\$249 list). In between is the Fidelity Gallery 4800 (\$120 list), which balances its very slow scanning with good color rendition and excellent software.

FILM SCANNERS

These specialized scanners are for users who want and need significantly higher-quality photos than either digital cameras or print scanners can deliver. They're designed to scan 35-mm or APS (Advanced Photo System) slides or negatives at a very high optical resolution. And because they incorporate better optics, sensors, and other components, they are more expensive than snapshot and flatbed scanners. Also, the resulting files are much larger (up to 27MB per image), so scan times can run from 1 to 15 minutes per image. But you'll get far sharper, richer, more detailed images.

If you have an APS camera, the Fujifilm AS-1 (\$599 list) APS film scanner is fast to install and set up. Its software lets even technophobes produce superior scans. For traditional 35mm photographers, the Minolta QuickScan 35 Plus (\$995 list) has a pro-like interface for creating better-quality scans than other scanners in its class. And Konica's Q-Scan (\$799 list) scans both 35-mm and APS film formats.—*DG and SWG*

PictureWorks Technology

HotShots

A productivity tool for photo editing, PictureWorks Technology's HotShots (\$100 street) efficiently moves pictures through its interface. But this convenience comes at a price: HotShots' tools lack the depth and subtlety found in more powerful programs.

HotShots' slick interface makes the program easy to grasp. Its centerpiece is a toolbar that looks like a remote control, where all tools and commands are organized and accessible. Four icons at the top of the Remote Control (Get, Enhance, Share, and Internet) change the tools available from the control dialog.

HotShots' Collection commands provide automatic batch cataloging of image files (plus .AVI and .WAV files) from your drives, input devices, or the Internet. The search engine is comprehensive and can even include voice annotation. We were surprised, however, that with such powerful cataloging, HotShots' own clip art doesn't come arranged in albums.

One of HotShots' noteworthy components is SmartPix, which can instantly correct tone and color to compensate for the lighting conditions in which an image was taken. Such ease-of-use functions are an advantage, but they often come at the price of power, and HotShots limits your options. For instance, the By Example image correction and Special Effects let you edit images by simply selecting the best-looking thumbnail from a series—but you have no control over the level of correction or effects applied to the thumbnails. During testing, the default settings often presented relatively coarse changes in our images. HotShots' paint brushes and text tools are also limited.

The program relies on thumbnails for its printing options as well. But here the results are more impressive. Smart Print creates nine variations on a user-definable portion of your image that you can then print as a test strip. Double-clicking on the thumbnail automatically adjusts the amount of ink and sharpening in the image for the best possible print. HotShots only supports five image sizes.

HotShots comes with innovative Internet features. You can obtain images from 12 photo services and online image libraries. And the program has links not only

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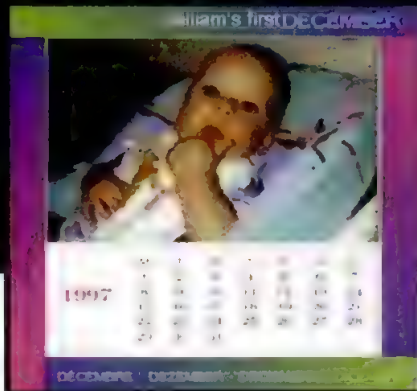
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Hot Shots

We selected this photo from a HotShots collection of pictures taken with a Nikon CoolPix 300 digital camera. In the Enhance page of the Remote Control, we selected an oil-paint effect. To get the look we wanted, we applied it twice—once at its highest setting and again at a medium setting.

To use this picture in one of the templates, we had to save it under a new name. Then we went into the Share page and selected a calendar from the Photo pages. By double-clicking on the empty space in the calendar, we inserted the oil painting picture into the template. With the text tool, we placed the words "William's first" and adjusted the color of the type to match. We used HotShots' Smart Print function to fine-tune the sharpness and saturation of the calendar to get good results on our printer.



to PictureWorks' technical support but also to relevant online magazines and discussion groups. In addition, HotShots includes a trial version of PictureWorks' \$49.95 Net-Card software, which lets you send personalized postcards via the Internet.

HotShots provides all the right tools, even if it isn't deep in user controls. If all you want is a program for quick photo cataloging, basic image correction, and output, this program may meet your needs. Yet, less expensive programs in this roundup offer similar ease of use combined with a more robust feature set.—*Sally Wiener Grotta and Daniel Grotta*

HotShots. Street price: \$100. Requires: 486-based PC or better, 16MB RAM, 50MB hard disk space, Windows 95 or Windows NT 4.0. PictureWorks Technology Inc., Danville, CA; 800-303-5400, 510-855-2001; fax, 510-855-2019; www.pictureworks.com. Circle 463 on reader service card.

MetaCreations Corp.

Kai's Photo Soap

The maker of the distinctive Kai's Power GOO, MetaCreations Corp., has forged a reputation for innovative program design. Its latest product, Kai's Photo Soap (\$50 street), lives up to that image. This product has an exquisite interface and produces impressive results. But the unique interface may be confusing for even sophisticated users, and some key features are missing.

To be creative with Kai's Photo Soap,

you must first let go of your preconceptions about image-editing programs. The program's modular design consists of seven rooms. As you work on an image, you move from room to room, employing the tools tailored to each setting. You take tools from "drawers," and you adjust controls and zoom levels with slider bars.

At times, the interface seems to get in the way of usability: The lack of labels or



Kai's Photo Soap

This old black-and-white Polaroid photo is faded and has lost contrast and detail. In Photo Soap's Tone Room, we globally increased contrast and decreased brightness. Then we used the brushes in the Tone Room to adjust contrast and brightness in specific areas. We cropped the picture in the Prep Room. Then in the Finish Room we placed a background, picture frame and flowers from the clip art collection. When we rotated and flipped the roses, their predefined drop shadows automatically adjusted to the correct orientation. Text too came into the picture, with its own drop shadow, and it remained editable at all times. The text was the only part of the picture whose color we could adjust in the Finish Room. Finally we printed the picture as a greeting card. We were able to save our layout in a drawer so we could use it again.

on-screen tips, for example, makes for a cleaner, more attractive screen but can make the program more difficult to use.

Real-time imaging is Kai's Photo Soap's hallmark. Brush away red eye, heal a scratch, or push a slider to shift the colors, and the image changes before your eyes. Based on the same technology found in the Power GOO, Kai's Photo Soap performs all editing on a mask, a separate layer that floats above the original photograph.

Painting is different from the method found in any other program. Rather than applying colors, the brushes apply effects such as hue shifts, lightening, darkening, contrast adjustments, and sharpening. The controls are very precise, allowing effects from subtle to extreme. You can easily save tool settings and zoom levels and recover them with a single mouse click. And because you are painting on a separate mask, you can simply nudge previously created strokes into place. All brushes in a room apply the same effect, however, until you save the image, which merges the original with the mask.

During our testing, the program produced uneven results. The collection of tools and technology is impressive, but there are some irritating limitations. Though you can create albums with as many pages as desired, Kai's Photo Soap



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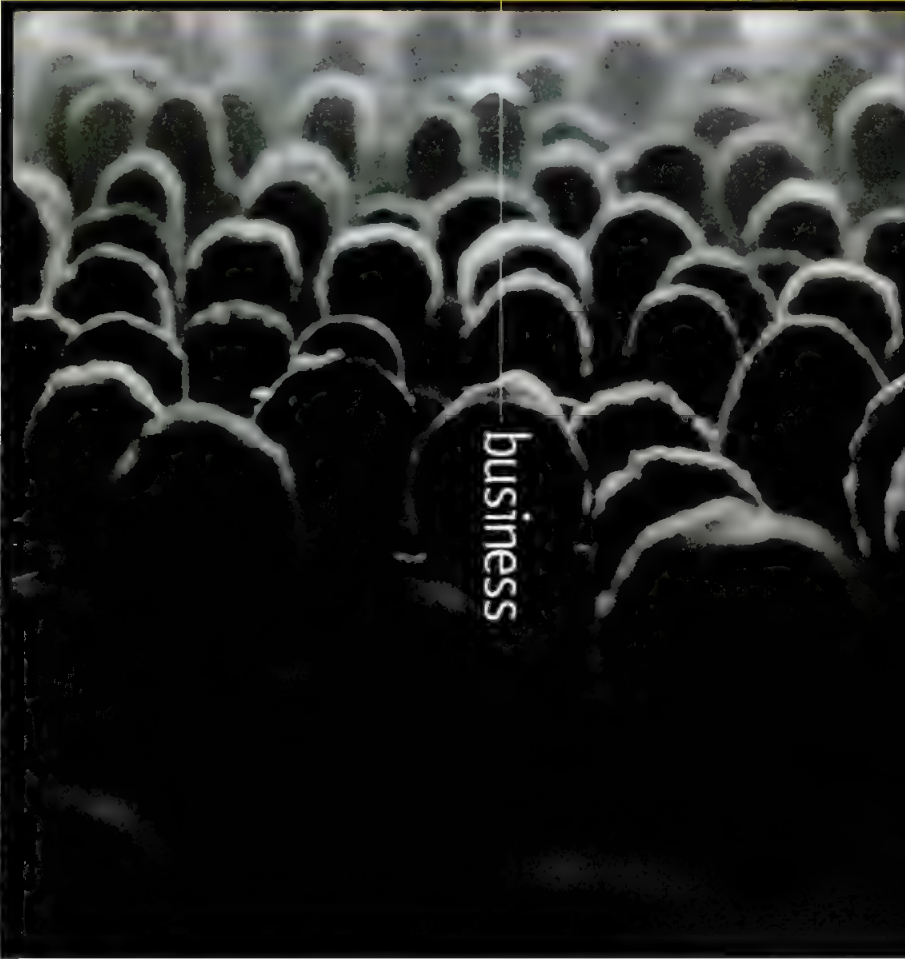
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The Outs of Digital Imaging

It's always fun to see a fresh set of prints. After hours or days of waiting, you eagerly open the envelope and browse through the glossy images from your recent vacation, place the prints in an album, or mail them to your grandparents. With recent advances in printing, you no longer have to wait to get your hands on those prints. Once you have them in a digital format, you can enjoy the same experience at home by editing your images with any of the programs in this review and outputting them to a compact, affordable photorealistic printer.

A photorealistic print looks, at least on first glance, as if it were produced in a darkroom. Most desktop color ink-jet printers are described as *near-photo* quality because they can't generate true continuous-tone pictures. Look closely at ink-jet output and you'll immediately notice that each picture consists of many thousands of tiny colored dots. Photorealistic printers eliminate these dots and dithers. Instead, primary colors are blended into 16.7 million colors, just as an artist mixes paints on his palette, to create a seamless image.

A new breed of miniature photorealistic printers, dubbed snapshot printers, uses this technology to generate 3.5- by 5-inch to 4- by 6-inch prints. They are parallel-port devices that run under Microsoft Windows 95. Most cost between \$400 and \$500 and are about the size of an answering machine. One model even slips into a half-height disk-drive bay. They're as easy to set up and operate as desktop ink jets and take an average of 2 to 3 minutes to output each print.

All snapshot printers use either *dye-sublimation* or *Thermo-Autochrome* technology. The more common "dye-sub" process has between 200 and 300 thermal points. At each point, up to 255 different levels of heat are applied to a sheet of pigment, which is then embossed onto coated paper. The precise temperature determines how much pigment is applied at each point. The layers of dye melt, blend and dry together into continuous colors.

Fargo's FotoFun! (\$599) is a typical snapshot dye-sub printer. It produces excellent 4-by-6 prints, the largest of all the snapshot printers. The only inconvenience is the ribbon, which comes on two plastic rollers; other snapshot printers use one-piece packs or cartridges. Fargo also makes the printer for Argus, which bundles it with more software and sells it for \$100 less.

Olympus' P-300 (\$399 list), Sony's DPP-M55 (\$500 list), and Casio's DP-8000 (\$400 list) dye-sub snapshot printers work with any PC. They're also designed to connect directly to their respective vendors' digital cameras.

Fuji's Thermo-Autochrome process is similar to dye sublimation. The primary difference is that with Thermo-

Autochrome, the heat-activated colors are embedded into special paper and not applied from plastic sheets.

One example of a Thermo-Autochrome printer is Panasonic's TruPhoto (\$299 list), which is fast and convenient to load because it has a feeder tray that accommodates up to 20 sheets at a time. It's more environmentally friendly because there are no cartridges or used spools to throw out. Print quality isn't great, however, and it's slower than dye-sub units.

How good do the prints look? That depends. Most users won't be able to tell the difference between photo-quality and true photographic prints. But a closer comparison will reveal that computer-generated prints aren't as sharp, detailed or accurate as real photographs. Frankly, the quality difference is probably immaterial because amateur snapshots are for fun and family, not for professional use.



Dedicated snapshot printers include the Casio DP-8000 and Fargo FotoFun! (front). The Epson Stylus Color 600 (rear) is an all-around ink jet printer.

But before you run out to buy a snapshot printer, here are some things to consider. The average cost per print (paper and ribbon) is about a buck, about two to four times as much as a silver-based photographic print. And unlike true photographic prints that will last years without fading or discoloring (unless exposed to direct sunlight), snapshot printer output remains stable only for about a year. Some printers automatically laminate a special UV-resistant coating over the print to protect it.

Unlike most ink jets, which can be used for a variety of functions, snapshot printers only create snapshot-size photos. And though most ink jets can't produce true photo quality, the latest generation of high-resolution, 4-, 6-, and 7-color near-photo-quality printers cost about the same as snapshot printers and produce gorgeous output on a variety of media. For more information, see our roundup of ink jet printers, "Personal Printers," in the November 4, 1997, issue.—DG and SWG



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has no batch processing, so you have to open each photo and manually place it in an album page. In addition, all albums must stay on the desktop. Even more disconcerting was the program's uneven Twain support; it worked with some cameras and not with others.

You can't have more than one image window open at a time, nor can you combine elements from different pictures. And given the company's roots in special effects, we were surprised that Kai's Photo Soap doesn't come with any special effects other than a nice "edges" library in the clip art. File-format support is minimal, and the product has no Internet features. The clip-art library is superb, but the program offers only templates, not the projects.

Despite all that is lacking, Kai's Photo Soap has a lot going for it. A different kind of program, it concentrates on cleaning up photos and giving you the tools to be truly creative with images.—*SWG and DG*

Kai's Photo Soap. Street price: \$50. Requires: Pentium-based PC or better, 16MB RAM, 20MB hard disk space, Microsoft Windows 95 or Windows NT 4.0. MetaCreations Corp., Carpinteria, CA; 888-456-6382, 805-566-6200; fax, 805-566-6385; www.metacreations.com. *Circle 464 on reader service card.*

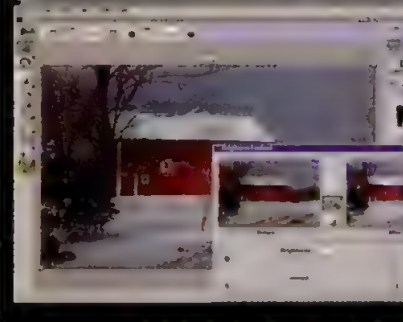
The LivePix Co.

LivePix

The standard-bearer on the consumer level for the emerging FlashPix format, LivePix 1.1 (\$50 street) is an innovative product with a solid interface, and comes with some attractive and unusual clip art. But the product pales in comparison with programs such as Microsoft Picture It! and PhotoDeluxe 2.0 in terms of both usability and power.

Unlike most of the products in this roundup, LivePix focuses almost entirely on collaging. It offers controls for adjusting brightness, contrast, tint, and saturation, as well as a red-eye reduction tool, grid distortion, and drop shadows. But the product only has three true special effects—distort, color tint, and opacity.

To begin a project in LivePix, you can simply drag a sample project or photo from the Gallery onto the main window. The Gallery also houses the program's clip art and image albums as well as any



LivePix

Though LivePix doesn't perform any automatic image enhancement, it does provide before-and-after thumbnails for adjusting brightness, contrast, and color saturation. Incorporating the image into a calendar entailed choosing the desired project—a single-month calendar—from the Gallery and dragging it into the main window. To substitute our corrected image from the placeholder in the template, we chose it from our photos in the Gallery, selected the image we wanted to replace, and clicked Substitute. We then rescaled the landscape picture to fit the template's orientation, increased the feathering around its edges with a slider control, and moved the object block with the calendar to balance the layout.

custom albums you create. Unlike several programs in this roundup that make you tab through different views of a folded card or brochure, LivePix displays all views simultaneously.

The program employs a standard icon-based tool palette with accompanying tool ribbons for settings such as opacity and feathering (which dissolves edges into the background). In this respect, LivePix proved to be more flexible than Picture It!. But other than an introductory tour and the help system, LivePix offers novice users little guidance and no step-by-step instructions. The program also lacks context menus. You perform all operations (such as moving objects up and down the stack, and color operations) from the main menus. Despite these omissions, LivePix is not especially difficult to use, but its interface doesn't really stand out.

Some tools—most notably the quick-mask tool similar to Microsoft Picture It!'s—work well. Others don't work well at all. For instance, you perform red-eye reduction essentially by selecting the red area and desaturating specific colors. We found this procedure tedious and difficult to perform.

We did find LivePix's projects and clip art attractive, and the product's designs are unusual and interesting; LivePix will appeal more to the design-oriented individual than to your typical Hallmark consumer. But LivePix doesn't offer many project templates, nor does it

provide Web-based content.

Aside from Microsoft Picture It!, LivePix is the only product we reviewed that fully supports the FlashPix format for better handling of high-resolution files. You can try out LivePix yourself by downloading version 1.0 from the company's Web site. LivePix is a respectable program that covers all the bases but fails to hit a home run. Other programs offer more power and better interfaces.—*LG*

LivePix 1.1. Street price: \$50. Requires: 486-based PC or better, 8MB RAM, 40MB hard disk space, Microsoft Windows 95. The LivePix Co., San Francisco, CA; 800-724-7900, 415-382-4735; fax, 415-908-1058; www.livepix.com. *Circle 465 on reader service card.*

MGI Software Corp.

MGI PhotoSuite

One of the top-selling photo editors, MGI PhotoSuite 8.5 (\$50 street) is easy to use and boasts a wide range of tools and features. However, our testing revealed that the program suffers from some significant limitations, and its features lack depth. At press time, MGI Software was

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Image Editing



Mgi PhotoSuite

We created a new thumbnail album of all our portraits using PhotoSuite's new album feature. Our favorite picture was dark and poorly exposed, so we used the Enhance Colors command, setting the slider to an enhancement level of 8, to brighten the entire image

nicely. Unfortunately, that made the skin tones too red. To compensate, in the Adjust Colors dialog we reduced red and blue from 1.0 to .87, leaving green at 1.0. One more visit to the Enhance Colors dialog helped liven up the colors sufficiently. We added a word balloon from the clip art library, but the text we typed didn't fit directly into the balloon, so we spent some time formatting and fitting it. With the Fun menu, we chose to convert the picture into a magazine cover. Finally we resized the image to fit the space and printed.



working on a major upgrade.

In a market in which programs such as Kai's Photo Soap and HotShots are forging distinctive interfaces, PhotoSuite has held fast to tradition. The main interface consists of a set of toolbars on the left, a pull-down menu, and a color palette on the right. When you launch the program, you are greeted by an Activities Guide.

The handful of projects in PhotoSuite—called Fun with Photos—are generally easy to follow, except for the red-eye and body-switch projects. Those two projects simply open the appropriate images in your workspace; the rest is up to you. The Create Activities (for making cards, posters and such) are also disappointing. Rather than full-fledged projects, these actually place a frame around your image and allow you to preview it before printing. But you can't edit or save these projects—one of the most serious shortcomings of the program.

The tools for editing, collaging, and painting images are also limited. For example, you can use the selection tools for copying and pasting portions of

images, but not for isolating a section of an image for changing color, tone, and so on. Rather than the traditional color-balance sliders, the Color Adjust dialog has three sliders that lighten or darken red, green, and blue values, causing color shifts.

Despite these shortcomings, PhotoSuite does have its strengths. Chief among them is ease of use. The program's manual is better than those of most products we reviewed, and the online help is even more impressive.

PhotoSuite organizes images into albums and includes a good search

engine. You can print contact sheets of multiple images, create slide shows (with audio), and share albums as HTML files, and PhotoSuite supports the PhotoNet service. The Convert to Web command helps optimize graphics for the Web.

Although we were not able to get it in time for testing, the next version of PhotoSuite will address many of the problems in this version. The new version should include a revamped interface with new step-by-step activity guides, including a PhotoFix activity for cleaning up your images fast. The program will also include additional photo projects and special-effects filters, among other new features; these should make PhotoSuite competitive once again.—SWG & DG

MGI PhotoSuite 8.5. Street price: \$50. Requires: 486-based PC or better, 8MB RAM, 38MB hard disk space, Microsoft Windows 95, Windows NT 4.0, or Windows 3.x. MGI Software Corp., Richmond Hill, Ontario, Canada; 888-644-7638, 905-764-7000; fax, 905-764-7110; www.mgisoft.com. Circle 466 on reader service card.

Microsoft Corp.

Microsoft Picture It!



By keeping the goals of a consumer-level image-editing product in sharp focus, Microsoft has come up with a winner in Microsoft Picture It! 2.0 (\$55 street). Unlike the suite-based programs in this roundup (Corel Print House Magic and Micrografx's Windows Draw 6), Picture It! is a single application designed for a specific job: editing and working with digital photos. While it can't match the breadth of a suite, Picture It! offers all the tools you need within a well-designed interface.

When you install Picture It!, the program automatically installs the Media Manager, which creates a new folder called My Pictures). The My Picture folder takes advantage of Common Object Model extensions to store extra file and directory information with each image.

Picture It!'s interface is very visual: Each flyout menu—additional selections that appear when you pass or “fly” over a toolbar's icons—offers a thumbnail illustration and a description of the function of that tool. The filmstrip along the bottom of the screen holds thumbnails of all the open projects, which can include greeting cards, calendars, certificates, trading cards, business cards, stickers, and custom mats. When you select one of these projects, you have the option of switching to it or adding part or all of it to the project currently in use.

As with Corel Print House Magic, when you select a tool or project from the left panel, the panel changes to become a step-by-step guide to completing a given task. Here, we really like Picture It!'s Hue/Shade color swatches, used for selecting gradient fills. We would prefer all of Picture It!'s fills to use this approach; currently, the others use an HSL (hue/saturation/lightness) scheme that is not as intuitive.

The Smart Task Fix tools include red-eye reduction, color correction, and brightness/contrast adjustment. They work well, though we obtained much better results by manually outlining the red portions of the eyes. Picture It! also offers a small but attractive set of special-effects tools and easy collage manipulation.

The program doesn't support plug-ins, but its engine does, so future versions will

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Microsoft Picture It!

To clean up this image for use in a calendar, we took advantage of two of Picture It!'s automatic Smart Task Fix controls, Brightness & Contrast and Correct Tint.

Afterward, we manually sharpened the image a bit. Creating the actual calendar was a snap. We chose the three-month design from the Calendar fly-out on the Project tab and followed the step-by-step instructions on the panel, which primarily consisted of dragging the corrected image from the filmstrip to replace the image in the template.



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likely offer them. Picture It! also boasts a complete set of output options, including printing via Kodak's Image Magic service, thumbnail prints, and multiple reprints of images. In addition, a number of Picture It!'s projects integrate well with the Internet; for example, you can create e-mail postcards, which Picture It! saves and sends as executable files. Picture It! also

supplies Wizards for generating slide shows.

Like Adobe PhotoDeluxe, Picture It! forces you to perform tasks in a step-by-step manner. This approach can become tedious at times, but it fulfills the needs of consumer-level users. And of the products we review here, Picture It! offers the best balance of power and usability.—LG

Microsoft Picture It! 2.0. Street price: \$55. Requires: Pentium/90-based PC or better, 16MB RAM, 90MB hard disk space, Microsoft Windows 95 or Windows NT 4.0. Microsoft Corp., Redmond, WA; 800-621-7930, 206-882-8080; fax, 206-936-7329; www.microsoft.com. **Circle 467 on reader service card.**

Images in the Round

Fra picture is worth a thousand words, a panoramic image can tell an entire tale. Panorama software stitches an overlapping set of photographic images into a single 360-degree image. Two consumer-level packages, PhotoVista and Spin Panorama, were released at almost the same time but differ significantly in features and convenience.

PhotoVista (\$129 list) is a stunningly automated program that does everything but take pictures for you. You tell the program which camera model you're using and the program tells you how many pictures you'll need to produce a 360-degree panorama. The program automatically aligns and overlaps your images. Another click blends the edges together to create a preliminary low-resolution panorama in a few seconds. If you like the results, you can create a finished high-resolution panorama and export it as a JPEG image. You can

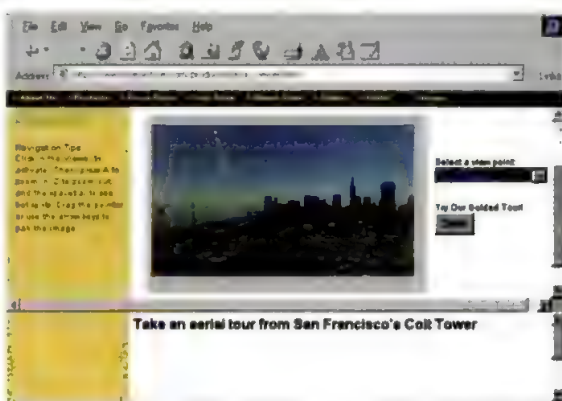
add the files to a Web page or save panoramas as screen savers. On a Pentium/200 test system, the process took less than 5 minutes. (Live Picture Corp., Scotts Valley, CA; 800-724-

Apple's QuickTime plug-in. But Spin Panorama is much harder to use because you have to select two matching control points on each side for every seam between two images.

It took us an hour to achieve results that were visibly inferior to those produced in a few seconds with PhotoVista. (PictureWorks Technology Inc., Danville, CA; 800-303-5400; www.pictureworks.com. **Circle 475 on reader service card.**)

A different type of product, the **Portal S1 Panoramic Capture System** (\$10,000 list) also deserves mention. A hardware/software solution, the Portal S1 has a metal-plated dome that captures a 360-degree image (plus 50 degrees above and below the

horizon) on a single frame of film. The included software converts the image into a standard format. The Portal S1 fits on any 35-mm or digital camera using a standard Nikon mount.—EM



The new Live Picture Java Viewer applet lets you view panoramic images without installing a plug-in.

7900; www.livepicture.com. **Circle 474 on reader service card.**)

The **Spin Panorama** (\$99 list) generates QuickTime VR files that can be viewed in any browser equipped with

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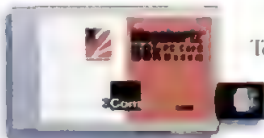
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Get the Picture

omewhere in that haystack of your hard disk lies that image you're looking for, but you can't remember its name. The solution is an image-cataloging utility that generates thumbnails of graphics and displays them in searchable "albums." We looked at three image-cataloging packages.

PhotoImpact Album 3.0 (\$49.95 list) stands out for its speed, extensive and up-to-date import filters, and flexibility. You can open more than one album at a time, and you can display different sections of the same album in separate

windows. You can also view notes and keywords as you scroll through thumbnails. (Ulead Systems Inc., Torrance, CA; 800-858-5323; www.ulead.com. Circle 477 on reader service card.)

An album-making utility, **PhotoRecall** (\$69.95 list) also provides basic image editing. Its interface mimics an actual photo album. The albums can store either thumbnails or full images. You can assign titles and annotations to each image and search the current album or all albums. You can adjust brightness, color, and other attributes. (G & A

Imaging Ltd., Hull, Quebec, Canada; 888-772-7601; www.ga-imaging.com. Circle 478 on reader service card.)

ThumbsPlus, Version 3.0, (\$65 list) is more of an image-oriented file manager. It creates searchable databases of images and supports almost all graphic file formats. Keyboard shortcuts let you quickly assign keywords to images. You can also print "contact sheets" and perform batch conversions. (Cerious Software, Charlotte, NC; 704-529-0200; www.cerious.com. Circle 479 on reader service card.)—EM

The Learning Company Inc.

PhotoFinish

The latest incarnation of an entry-level bitmap editor dating back to 1993, PhotoFinish 4 combines up-to-date selection and retouching tools with an interface and feature set that seems partly left over from the Windows 3.x era. The Learning Company's program (\$50 street), now in Version 4.1, includes a basic set of editing tools and special effects that work well enough. But PhotoFinish 4 is missing some key features and can't match other programs in this category.

PhotoFinish 4 lets you modify existing images or use basic paint and text tools to create new ones. You won't find projects or wizards that help you create collages, cards, and signs, however, and you won't find automation features, such as one-step filters to fix damaged photos or remove red-eye. The package has no Internet-related features at all, and can't open GIF files, the most common image format on the Web—although it can convert images into GIF files when saving. Finally, PhotoFinish 4's filters are not as technically sophisticated as those in Adobe PhotoDeluxe, for example.

Nevertheless, the program does have some high points. PhotoFinish 4 offers conveniences such as cloning between two images, unlimited undo and redo, and previews for filters and effects. PhotoFinish 4 displays the images in two windows, so you can zoom in to make pixel-by-pixel changes in one window while your edits appear simultaneously at normal scale in the other.

The interface consists of a top-line menu, up to four floating or dockable toolbars, and a bottom-line status bar. One toolbar includes basic file and copy/paste functions, plus icons for one-click enhancements (such as the removal of moiré, an undesirable pattern that sometimes appears on images), auto-straightening, improved brightness and sharpness, and an icon that applies all the automatic enhancements at once. A second toolbar contains drawing, painting, and text tools. A third toolbar displays options for the currently selected tool, and a fourth displays the color palette.

Most special effects and filters are accessible only from the top-line menu, not from a toolbar. When you select part of an image and choose a filter, a window pops up with a thumbnail of the image and nine thumbnails showing the effects of different settings of the filter. You can adjust the presets to achieve coarser or finer results. With baffling inconsistency,

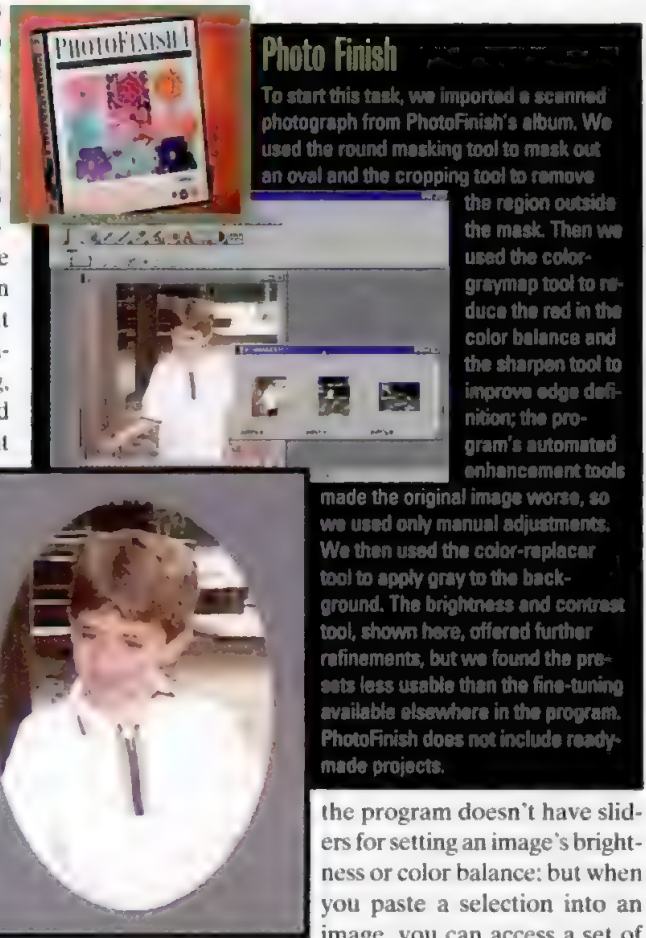


Photo Finish

To start this task, we imported a scanned photograph from PhotoFinish's album. We used the round masking tool to mask out an oval and the cropping tool to remove the region outside the mask. Then we used the color-graymap tool to reduce the red in the color balance and the sharpen tool to improve edge definition; the program's automated enhancement tools made the original image worse, so we used only manual adjustments. We then used the color-replacer tool to apply gray to the background. The brightness and contrast tool, shown here, offered further refinements, but we found the presets less usable than the fine-tuning available elsewhere in the program. PhotoFinish does not include ready-made projects.

the program doesn't have sliders for setting an image's brightness or color balance; but when you paste a selection into an image, you can access a set of sliders that control transparency and the pasted-color range. Therefore, you may have to cut and paste an entire image to gain access to the effects you want.

With its basic feature set, puzzling program conventions, and dated interface, PhotoFinish 4 can't compete neck-

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*Free upgrades available on model nos. XU1560, CC1560, XU5560, and CC5560 through June 30, 1998. U.S. and Canada only. †Notebook with Windows 3.1x or Windows 95 speaker, microphone and sound capabilities required. Spectrum Connected, Inc. is a trademark of Spectrum Information Technologies. SPECTRUM Connected™

SUMMARY OF FEATURES

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Image-Editing Software



	Adobe PhotoDeluxe 2.0	Corel Print House Magic 3.0	HotShots	Kai's Photo Soap	LivePix 1.1	MGI PhotoSuite 2.5	Microsoft Picture It! 2.0	PhotoFinish 4	Windows Draw 5
General Features									
Street price	\$50	\$40	\$100	\$50	\$50	\$50	\$55	\$50	\$50
Levels of undo/redo	1	4	Unlimited	Unlimited	Unlimited	1	1	Unlimited	50
Can resize canvas	■	■	■	■	■	■	■	■	■
Can work with multiple image files simultaneously	■	■	■	■	■	■	■	■	■ (Photo Magic and Instant 3D modules only)
Wizards or templates	■	■	■	■	■	■	■	■	■
Clip-art or photos included	768	30,600	None	700	180	650	497	2,000	53,000
Twain 1.6/Twain 1.7 support	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Albums/Collections									
Image-library interface	■	■	■	■	■	■	■	■	■
Can print contact sheets	■	■	■	■	■	■	■	■	■
Search engine	■	■	■	■	■	■	■	■	■
User-definable keywords	■	■	■	■	■	■	■	■	■
Image Correction									
Red-eye-removal tool	■	■	■	■	■	■	■	■	■
Color balance	■	■	■	■	■	■	■	■	■
Brightness/Contrast	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Hue/Saturation/Lightness	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Sharpen filter/Blur filter	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Image Editing									
Crop/Skew/Rotate	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Perspective tool	■	■	■	■	■	■	■	■	■
Paint brushes	■	■	■	■ (effects only)	■	■	■	■	■
Brush size/angle controls	■ ■	■ ■	■ ■	■ ■	N/A	■ ■	■ ■	■ ■	■ ■
Multiple brush shapes	■	■	■	■	N/A	■	■	■	■
Gradient tool	■	■	■	■	■	■	■	■	■
Multicolor gradients	■	■	■	■	■	■	■	■	■
Eyedropper/cloning tools	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Special-effect filters	49	22	40	1	1	29	250	25	52
Compositing Tools									
Masking/selection tools	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Cutouts	■	■ (Wrappers)	■	■	■	■	■	■	■
Layers/Layers palette	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Objects/Objects palette	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Text Handling									
Insert/edit text in images	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Text remains vector-based	■	■	■	■	■	■	■	■	■
Fills with gradients/textures	■ ■ ²	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Shape text to path/object	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Drop shadows/Rotation	■ ² ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Projects									
Number of projects	58	12	250	32	150	12	386	None	More than 1,000
Greeting cards/Brochures	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	N/A	■ ■
Banners/Certificates	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	N/A	■ ■
Labels/Business cards	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	N/A	■ ■
Projects can be e-mailed from within the program	■	■	■	■	■	■	■	N/A	■
Links to online processing services	■	■	■	■	■	■	■	N/A	■

(1) This feature works only with images supplied with the program. (2) Only if the image is saved as a bitmap in PhotoDeluxe 1.0 format. N/A—Not applicable: The product does not have this feature.

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* Estimated street prices. All performance tests conducted by Matrox Graphics Inc. Windows NT tests conducted by Matrox Graphics Inc. on a Dell XPS H266 configured with an Intel Pentium® II, 266 Mhz processor with 512K cache and 32 MB of RAM. Matrox Millennium II, Number Nine 128 Series 2, ATI 3D ProTurbo + PC2TV, and Diamond FireGL 1000 were all configured with maximum memory configurations using driver revisions 3.20, 4.102.03, 3.1.76, and 2.70.4.0.27 respectively. WinBench® 97 business tests conducted at 1280 x 1024 @24-bit at 75Hz vertical refresh using small fonts under Windows NT 4.0. Pentium is a registered trademark of Intel Corporation.



July 1997

Matrox Mystique 220 Series

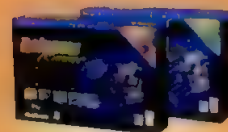
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August 1997

Matrox Millennium II

\$199* (4 MB RAM)



October 1997

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\$199* (Mystique Series) \$229* (Millennium II)

1280 x 1024 @ 24-bit

Matrox Millennium II (16MB)	98
Matrox Millennium II (4MB)	83
ATI 3D ProTurbo + PC2TV (16MB)	67
ATI 3D ProTurbo + PC2TV (4MB)	33
Diamond FireGL 1000 (8MB) W/S	

Windows NT

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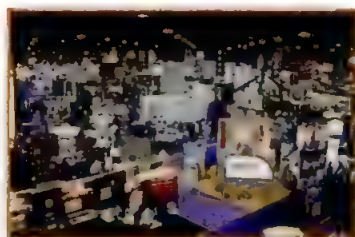


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and-neck with the leaders in this category.—EM

PhotoFinish 4. Street price: \$50. Requires: 486-based PC or better, 8MB RAM, 10MB hard disk space, Microsoft Windows 3.x or Windows 95. The Learning Company Inc., Cambridge, MA; 800-227-5609, 617-494-1200; fax, 617-494-1219; www.learningco.com. Circle 468 on reader service card.

Micrografx Inc.

Windows Draw

Micrografx's Windows Draw 6 (\$50 street) offers a wealth of features. The suite's central module, Draw, combines page layout and drawing capabilities, projects, and Web-page creation with basic photo editing. The Photo Magic module has more robust photo editing, and the Media Manager keeps your images organized. Finally, Instant 3D is a simple drag-and-drop interface for creating 3-D objects and scenes. You can use each program separately, but you'll get the most out of the suite if you start with Draw.

Draw provides answers and help at every turn. Even if you're a graphics novice, you'll be up and running in minutes. Once you've learned the program, you can turn off the context-sensitive instructions and tips. The hundreds of projects are fully editable. A wizard will even help you design layouts for newsletters, postcards, business cards, and so on.

Though Draw is easy to use, there's some real power under the hood. Any object or block of text can be made into a hyperlink. Layers not only make it very easy to move and reedit objects, they also make

Windows Draw

To create an advertisement for a pet-sitting service, we used Windows Draw's projects wizard. We chose the Selling a Service flyer among the For Sale Signs under Banner, Flyers and Signs. After changing the text to fit, we inserted a Custom Picture Frame from the clip art library. Following the program instructions, we double-clicked in the middle of the shape to insert a photo taken using a Kodak DC 50 digital camera. A slider dialog allowed us to choose how the picture would fit into the placeholder shape. Then, by selecting a command that came up when we right-clicked on the picture, we sent the image to the back of the stack of objects in the flyer so that the text appeared on top of the image. We changed the color of the type and the lines and inserted the appropriate phone numbers on the flyer before saving and printing.

it easier to produce animated GIFs. And masks that have been saved with image files are automatically used as clipping paths (boundaries that define the edges of an image) within Draw.

Photo Magic's

features are more uneven. The Photo Fix wizard (which you can set to initialize whenever you use a scanner or digital camera) does a good job straightening images, cropping, removing moire patterns, and adjusting color and exposure. Yet the red-eye removal wizard relies on an elliptical mask that doesn't match the irregular shape of the typical red-eye effect, and it converts the selection to gray scale, which dulls the eyes' natural highlights.



Beyond the wizards, Photo Magic is a powerful image editor. Tools, brushes, and commands offer precise control and creative options. The extensive library of special effects is easy to use, powerful, and fun. Windows Draw can open and save to

dozens of different file formats. Web support includes the ability to e-mail images directly from the program via any MAPI-compliant client.

The suite's weak link is Media Manager. While it organizes most of the large clip art library (the folder of backgrounds is not catalogued), adding collections and subjects requires too many steps. Neither does it support batch processing. Another drawback is the suite's size. A full installation requires up to 200MB of hard disk space; a compact installation takes 60MB.

Like Corel Print House Magic, the other suite in this review, Windows Draw 6 is comprehensive. For this market, Microsoft Picture It! has a slight usability edge, but for the more adventuresome, Windows Draw 6 is an excellent imaging entry.—SWG & DG

Windows Draw 6. Street price: \$50. Requires: 486-based PC or better, 8MB RAM, 55MB hard disk space, Microsoft Windows 95 or Windows NT 3.51 or later. Micrografx Inc., Richardson, TX; 800-733-3729, 972-234-1769; fax, 972-994-6227; www.micrografx.com. Circle 469 on reader service card. PC

Supported File Formats

The more powerful image-editing programs support a wide range of file formats.

Adobe PhotoDeluxe 2.0

Opens: AI, BMP, EPS, FLA, FFX, GIF, ICB, IFF, JPE, JPEG, Mac, MPT, PSD, PCD, PCK, PDD, PDF, PIC, Pict, PNG, PSD, RLE, Targa, TIFF, VDA, VST, WMF
Saves: BMP, EPS, FFX, GIF, ICB, IFF, JPE, JPEG, PBD, PCK, PDD, PDF, PIC, Pict, PNG, PSD, RLE, Targa, TIFF, VDA, VST

Corel Print House Magic 3.0

Opens: BMP, CMX, CPT, EMF, FFX, GIF, JPEG, PCD, PCX, PNG, PSD, RTF, TIFF, TXT, WMF, WPG
Saves: BMP, CMX, CPH, CPT, EMF, FFX, GIF, JPEG, PCD, PCX, PNG, PSD, RTF, TIFF, TXT, WMF, WPG

HotShots

Opens: AVI, BMP, EPS, PCX, GIF, JPEG, PCD, PCX, Pict, PSD
Saves: BMP, EPS, FFX, GIF, JPEG, PCD, PSD, TIFF

Kai's Photo Soap

Opens: BMP, FFX, JPEG, Photoshop, Pict, TIFF
Saves: Same

LivePix 1.1

Opens: BMP, FFX, GIF, ICB, JPEG, LPI, PCD, TIFF
Saves: Same

MGI PhotoSuite 8.5

Opens: BMP, DIB, FFX, GIF, JPEG, KOP, PCD, PCX, PIC, RLE, SPW, Targa, TIFF
Saves: BMP, DIB, FFX, GIF, JPEG, PCD, RLE, SPW, Targa, TIFF

Microsoft Picture It! 2.0

Opens: BMP, CDR, DFX, DIB, DRV, EMF, EPS, FFX, GIF, HGL, JPEG, MIX, PCD, PCS, Pict, PLT, PNG, Targa, TIFF
Saves: BMP, CDR, DFX, DIB, DRV, EMF, EPS, FFX, GIF, HGL, JPEG, MIX, PCD, PCS, Pict, PLT, PNG, Targa, TIFF

PhotoFinish 4

Opens: CGM, JPEG, PCD, PCX, Pict, Targa, TIFF, WMF
Saves: BMP, EPS, GIF, JPEG, PCX, Pict, Targa, TIFF

Windows Draw 6

Opens: AI, BMP, CDR, CGM, CMX, DIB, DRT, DRV, DSF, DSA, DVG, DXF, EMF, EPS, FFX, GEM, GIF, GRF, GX, HGL, IGS, JPEG, PCD, PCX, PLT, PNG, PPF, PP4, PP5, PRN, PS, PSD, RAS, SCT, S3D, Targa, TIFF, TXT, WMF, WPG
Saves: AI, CGM, DIB, DRV, DXF, EMF, EPS, GEM, GIF, GMP, HTML, IGS, JPEG, PCX, Pict, PLT, PNG, PPF, PP4, PP5, PSD, RAS, SCT, Targa, TIFF, WMF, WPG

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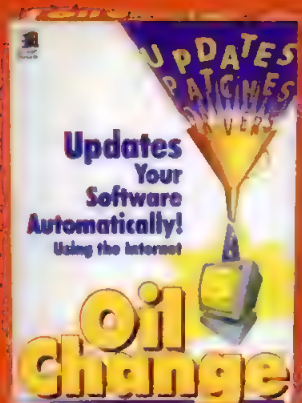
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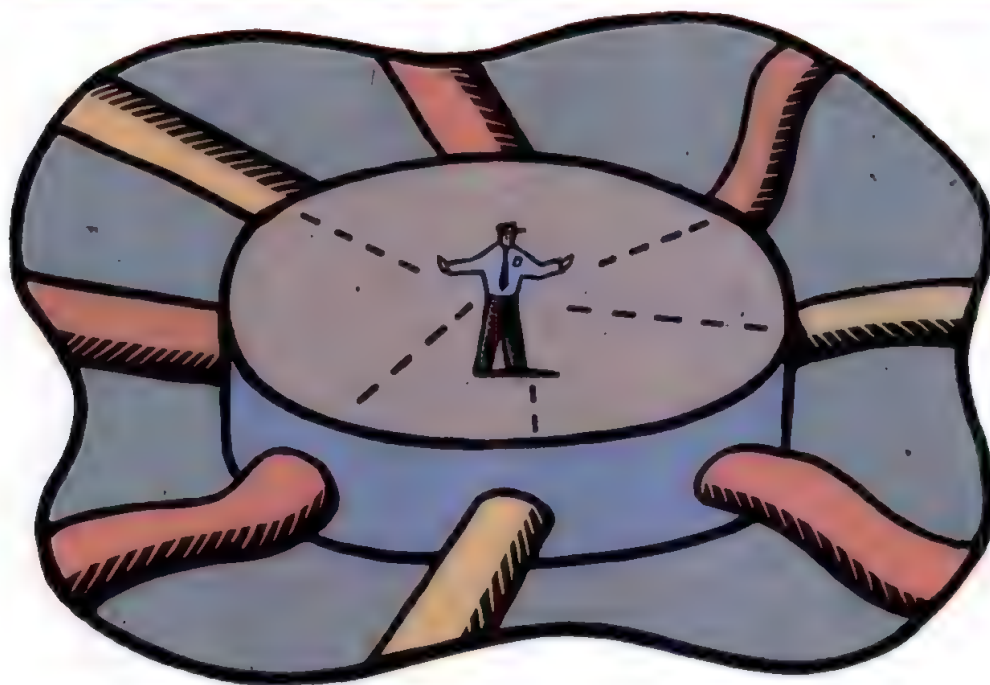
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Net Tools



Segment Sensitivity

Port-switching hubs can take the guesswork out of segmenting your network to increase performance.

By Steve Rigney

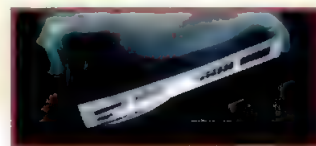
When heavy traffic slows down the network, many administrators tackle the problem by giving each individual user a port on an Ethernet switch or by installing shared 100 Mbps to each desktop. This will definitely increase performance, but it's an expensive solution that's usually overkill. Chances are, simply adding a segment or two to your LAN will speed up your network considerably and cost you a lot less money. For example, if 40 users are connected to one network adapter in your file server, simply

adding another server adapter will divide those 40 users between two segments, effectively doubling bandwidth. Unfortunately, figuring out how to place users on each segment effectively requires a lot of thought and effort, especially if you have dozens (or hundreds) of users and multiple servers.

In this roundup, we look at four products that can help: the Compex FreedomSwitch, the HP AdvanceStack 10Base-T Switching Hub-24R, the LANart SegWay Adaptive Microsegmentable Hub, and the 3Com SuperStack II PS Hub 50.

INSIDE

PORT-SWITCHING HUBS These hubs continually distribute ports among multiple internal segments based on ongoing traffic patterns. Contributing editor Steve Rigney reviews four devices from Compex, Hewlett-Packard, LANart, and



3Com to see how effectively they relieve traffic congestion on the LAN. *Page 221.*

NETWORK DESIGN TOOLS

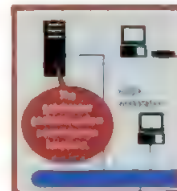
More than simple drawing programs, these tools come with their own knowledge of networks and existing networking hardware products. Frequent contributor Robert P. Lipschutz looks at two network design products from ImageNet and NetSuite. *Page 237.*

ISDN In our From the Bench section, contributing editor Les Freed tests a new ISDN server adapter card from Eicon that lets you call out on one BRI channel while receiving calls on another. *Page 238.*

VIDEOCONFERENCING ON THE NET

The H.323 specification for networked videoconferencing has arrived.

Frequent contributor Don Labriola explains the nuts and bolts of H.323 in this issue's Internet Tools column. *Page 243.*



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All files mentioned in this section are available for downloading from our Web site.

Net Tools

SWITCHING HUBS

These 24-port hubs feature *port switching*, a technology that segments your network without requiring multiple hubs. Even more important, all the products reviewed here include software designed to determine the best way to partition the ports. In a nutshell, they do the math for you.

WHAT ARE THEY?

Throughout our testing of the units in this roundup, we heard the same plea from all of the vendors: Explain these products. It seems that most people do not understand what port-switching hubs do. Many people confuse a port-switching hub with a standard 10Base-T hub or an Ethernet switch. They are neither, although the FreedomSwitch and SuperStack each include an Ethernet switch inside the hub. In the most basic definition, port-switching hubs are hubs that include multiple internal 10-Mbps LAN segments. The Compex, Hewlett-Packard, and 3Com products each come with four internal segments; the LANart unit comes with eight. You can either configure all of the ports on the hub to share a single segment or divide the ports among multiple segments.

But what really makes these products use-

ful is load balancing. A port-switching hub is capable of monitoring the traffic that passes through it and then using that information to decide which ports belong on which segments. Each product we reviewed performs this load-balancing task a little differently. The SegWay is the only product that constantly load-balances the network in real time. The software in the SegWay hub monitors the network every second of the day and moves a port to a different segment if the traffic changes. The FreedomSwitch and the SuperStack don't provide real-time load balancing, but they come close. The two products monitor network traffic constantly and load-balance at preset intervals, such as every 5 minutes or once a day. Compex and 3Com say this is all that is necessary, since network traffic doesn't change drastically every second. The FreedomSwitch, the SegWay, and the SuperStack also load-balance if a preset threshold is exceeded. For example, if the number of errors or collisions on a specific port exceeds the number you have defined, that port will move to another segment to try to solve the problem.

The AdvanceStack does not load-balance automatically. Although it continually monitors traffic, it requires manual intervention

in order to load-balance. Using the graphical utility that comes with the AdvanceStack, you issue a command that balances the ports on the hub. This approach is not as hands-off as the other solutions, but it should work fine if you remember to load-balance at different times of the day as your network traffic changes.

The products also use different formulas, or algorithms, to determine the best way to spread the load. The FreedomSwitch and the SuperStack use packet source and destination information. If two ports are constantly sending data back and forth to each other, these hubs will put them on the same segment. The other hubs in this roundup look at overall network traffic to determine the best way to load-balance. They figure out how to divide the total load across all of the available bandwidth.

To test these hubs, we set up a network of 38 low-traffic clients and 10 high-traffic clients. We assigned the clients manually among the hub's internal segments and tested for average client throughput. We then activated load balancing and retested throughput. Results varied. The FreedomSwitch created only minimal performance gains with load balancing, whereas the AdvanceStack and the SuperStack showed performance gains of 209 and 221 percent, respectively. The SegWay, with its eight segments, was the clear performance winner, producing a performance gain of 397 percent.

It's difficult to say which method of load balancing is superior, as the FreedomSwitch and SuperStack, which both look at packets' origin and destination, stood on opposite sides of the performance spectrum. Even without load balancing, however, these products can provide the segmentation you need to increase your LAN performance significantly and are list-priced at an average of \$75 per port, compared with up to \$90 or more for an Ethernet switch.

The number of segments contained within the hub is clearly the principal determinant of performance, as the SegWay was far and away the fastest of the hubs despite its less than optimal distribution of the ports among segments on our tests.

Keep in mind that for two of these products, the Hewlett-Packard and LANart units, you'll have to connect a switch, a router, or several server adapters for the segments to communicate with each other. The number of

EDITORS' CHOICE

• 3Com SuperStack II PS Hub 50



Each of the port-switching hubs we tested has its merits, but in terms of pricing, features, and performance, 3Com's SuperStack II PS Hub 50 came out the winner.

Priced at only \$1,799, the SuperStack II PS Hub 50 includes a built-in Ethernet switch, top-notch Windows- and Web-based management software, redundant failover capability on every port, and an optional 100-Mbps uplink. And the small office with growth in mind will appreciate the ability to stack up to ten SuperStack hubs. The unit also performed very well, showing a 221 percent performance increase when load balancing was activated.

The SuperStack's performance was surpassed by that of LANart's SegWay Adaptive Microsegmentable Hub, which comes with eight segments. But at \$2,235, the SegWay is more expensive than the 3Com product, especially since the SegWay re-

quires the purchase of a third-party switch to enable the eight segments to communicate. Nevertheless, we liked the SegWay's performance, the ability to stack up to five units, and the redundant port capabilities, and we award it an honorable mention. We were also impressed with the SegWay's unique ability to load-balance in real time.

The HP AdvanceStack 10Base-T Switching Hub-24R performed nearly as well as the 3Com product in our testing. Unlike the other three products in this roundup, the AdvanceStack requires manual activation of load balancing, but it comes with excellent management software. The Compex FreedomSwitch is similar in design to the SuperStack but is not stackable and came in last on our performance tests, possibly due to a problem with its 100Mbps uplink port.

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switch ports, routers, or adapters you need corresponds to the number of segments in the hub. Hewlett-Packard sells an optional switch module for \$949. The products from Compex and 3Com come with their own internal switches.

With the exception of the FreedomSwitch, all of the hubs are stackable. Each FreedomSwitch and SuperStack unit also offers an optional 100-Mbps uplink port you can use to connect to a server or a high-speed backbone.

MANAGEMENT

Each of the products includes a Windows-based utility that lets you configure, view, and monitor the hub and all of the ports. The SegWay includes a Web-based management package, but it was in beta when we tested the product. The 3Com includes both Windows- and Web-based management, and all the software is inside the hub. If you use a browser, no additional software is needed.

HP's SNMP management software uses a browser, but you still have to install the software on a PC. HP plans to offer a complete Web-based management package by spring of 1998.

Each of the management utilities also

provides a graphical depiction of the hub, complete with lights that signify when a port is in use. If you click on the ports, you can gather more detailed statistics, such as the amount of traffic and what segment the port is using. The AdvanceStack's software offers some of the best graphics and information.

Each product in this roundup also includes SNMP agents, so you can also gather port information using any SNMP management console, such as Hewlett-Packard's OpenView. And each product lets you connect a serial cable and use a terminal program to configure and gather statistics about the hub. You'll have to attach a terminal if you want to assign IP addresses to hubs.

SECURITY AND REDUNDANCY

In addition to their segmenting smarts, these products provide some useful security features. All of the hubs except the FreedomSwitch allow you to configure ports for redundancy. If a port fails, the redundant spare will take over. This means that you must connect the node to two ports on the hub, however. All these products allow you to set up security on specific ports. For ex-

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SWITCHING HUBS

ample, you can configure a port to work only with a specific Ethernet address. This prevents a user from disconnecting a port on the

hub or trying to connect an unknown device to the network.

Port-switching hubs provide an inexpensive way to add speed and intelligence to your network. Read on to see which is best for your network needs.

Compex FreedomSwitch

We found the Compex FreedomSwitch (\$1,795 list) to be a mixed bag. Like the 3Com SuperStack II PS Hub 50, it comes with its own internal switch, so you don't have to purchase a separate one to enable communication among the unit's four internal segments. It's also the easiest product to install and the only one besides the 3Com unit that takes traffic origin and destination into account when configuring segments. Unfortunately, it was the worst performer of the bunch, and when we activated load balancing, we found an improvement of only 16 percent, compared with 221 percent for the 3Com SuperStack II PS Hub 50.

According to Compex, some of the FreedomSwitch units have had problem with malfunctioning 100-Mbps uplink ports that continually reset themselves. This could have been the reason for the product's poor test results. Unfortunately, Compex was not able to get us another unit in time for this review.

The FreedomSwitch was also the only product we tested that wasn't stackable and could not be configured with redundant ports; this limits its use to smaller workgroups. To our surprise, we discovered that there was no manual or online help for the included management application. Compex says it plans to offer a manual and online help in the near future.

In addition to the usual 24 ports divided into four segments, Compex offers an optional \$250 100-Mbps uplink port that creates another segment and allows you to connect to a faster backbone. Each port has an LED for monitoring traffic and links, but the LEDs are difficult to see if you're not standing directly in front of them. Two Traffic-Volume LEDs, unique to the FreedomSwitch, show the percentage of traffic distributed to each of the four segments.

We found the FreedomSwitch to be the easiest product to install. As soon as the unit is turned on, it starts monitoring and balancing traffic to increase performance. As with

Hubs, Port-Switching Hubs, and Switches

Port-switching hubs sit between traditional Ethernet hubs and Ethernet switches in the price and performance spectrum.

	Ethernet hub	Port-switching Ethernet hub	Ethernet switch	Fast Ethernet hub
What it is	A central connection point that provides multiple nodes with a shared 10-Mbps pipe.	Same as a hub but divided into segments, each of which takes a small number of ports. Can usually adjust the number of ports per segment to load-balance.	A central connection point that provides each node with its own 10-Mbps pipe.	A central connection point that provides multiple nodes with a shared 100-Mbps pipe.
Best use	Providing connectivity for small workgroups.	Connecting workgroups to a high-speed backbone or to servers.	Connecting each hub, server, or high-end client to its own 10-Mbps segment	Connecting servers, high-end clients, and Ethernet switches to the network backbone
Where it is	Usually in workgroup areas.	Usually in departments or workgroup areas. May require an Ethernet switch to load-balance.	Usually in the wiring closet to connect to servers and 10-Mbps hubs.	In the wiring closet, connected to the backbone.
Price per port	\$45-\$85	\$70-\$90	\$90	\$150-\$190
Pros	Inexpensive yet perfectly suitable for most common applications.	Inexpensive. Provides better performance than a traditional hub. Many such units can automatically adjust segments for maximum performance.	Guarantees full 10-Mbps bandwidth on each port.	Provides high-speed connections for servers. Capable of handling more users than an Ethernet hub without losing performance
Cons	Slow. Supports only a handful of users before bandwidth is used up.	More expensive than a 10-Mbps hub. May require purchasing an Ethernet switch	Usually too expensive to use for all nodes.	Expensive. Requires Category 5 cabling and Fast Ethernet adapters

Net Tools

SWITCHING HUBS

the other products in this roundup, you can configure all of the settings on the FreedomSwitch using an out-of-band terminal connection, telnet, or the included Windows-based graphical utility. The only information you have to provide is the IP address of the hub and whatever SNMP Community Strings you need if you intend to manage the product with an SNMP console.

Like the SuperStack, the FreedomSwitch uses a load-balancing algorithm to keep traffic where it belongs. The included firmware constantly monitors which ports are communicating with which others and puts those ports on the same segment. For example, as part of our testing, we connected two file servers and five clients to the hub. We



SLOW AND EASY Installing the FreedomSwitch was a snap, but its performance was dead last.

configured clients 1 through 3 to communicate with the first server and clients 4 and 5 to communicate with the second server. After the FreedomSwitch became aware of this, it placed clients 1, 2, and 3 on their own segment with the first server. The AdvanceStack and the SegWay monitor all traffic to make load-balancing decisions, but they don't pay attention to where the traffic is coming from or going. By default, the FreedomSwitch performs a new load balance every 15 minutes, or sooner if it detects errors such as multiple collisions or overruns.

The FreedomView Pro management software uses the SNMP protocol to communicate with the unit over any IP or IPX network. In addition to providing a graphical depiction of the hub, the FreedomView allows you to monitor dozens of statistics and create detailed graphics based on many different criteria. There are, however, a few tasks you'll have to use the terminal command line interface to complete. For example, you can't update or add filter tables using FreedomView. And although the program

provides a lot of detailed statistics and an actual graphic of the hub, we found the graphics to be a little fuzzy.

FreedomSwitch. List price: \$1,795. Compex Inc., Anaheim, CA; 714-630-7302; fax, 714-630-6521; www.cpx.com. *Circle 951 on reader service card.*

HP AdvanceStack 10Base-T Switching Hub-24R

With its ability to stack up to eight hubs, and the best management software we tested, the HP AdvanceStack 10Base-T Switching Hub-24R is a decent choice for a LAN that is meant to start small yet leave room for growth. The AdvanceStack was also an excellent performer, coming in right behind the SuperStack in our tests. The AdvanceStack is the only product in this roundup that doesn't load-balance at preset intervals, but it does keep track of your network traffic over time and you can activate load balancing manually when you wish. The product retails for \$1,339 and includes 24 10Base-T ports, four internal LAN segments, management software, and a management module.

Like the other products in this roundup, the AdvanceStack is easy to install. To get your LAN up and running, you simply connect all of your nodes to the 24 ports and turn on the power. Configuring the hub for load balancing takes a few extra steps, however, using a dumb terminal or the bundled AdvanceStack Assistant SNMP software. This software works over IP or IPX and finds all of the AdvanceStack hubs on the network. The only task you have to perform with the terminal connection is to configure an IP address for the hub.

Unlike the FreedomSwitch and SuperStack, the AdvanceStack does not have an Ethernet switch bundled in the unit, so you have to connect 4 of the 24 front 10Base-T ports to an external Ethernet switch or router in order to enable the internal segments to communicate with each other. You can also purchase an optional switch module from Hewlett-Packard for \$949.

The switch module is actually an eight-port Ethernet switch. Four hidden ports are used to connect the AdvanceStack's internal LAN segments, and the other four can be used for attaching servers and other devices. If you use the switch module, the hub will automatically detect the segments and split all of your ports up among them in a round-robin fashion (port 1 to segment 1, port 2 to segment 2,

and so on). If you use an external Ethernet switch, you will have to use a terminal connection to designate four of the front ports to connect to the switch manually.

The AdvanceStack is the only product in this roundup that doesn't load-balance automatically at preset intervals. Instead, you must use a terminal connection or the Assistant utility to activate load balancing each time you want it to happen. One interesting feature is the ability to store traffic information monitored over time in a database. You can then have the Performance monitor utility use this information to distribute network traffic to the segments. The only drawback of this method is that you must keep the management station running while you collect the data. When we activated load balancing, the AdvanceStack's performance jumped 209 percent.

Our Advance Stack came with a management module and HP's Web-based SNMP management software, AdvanceStack Assistant. HP also sells the AdvanceStack with the module and software for \$1,229.

Assistant was the most useful management software we tested for this feature. It automatically draws a map of the SNMP devices on your network, locates the AdvanceStack hubs, and provides dozens of different statistics. You can also use Assistant to manage in-



MANUAL LABOR The AdvanceStack requires user intervention to activate load balancing.

dividual ports, set up redundant ports, and view the current segmentation. In addition, you can set up various thresholds for traffic and errors and use all of this information to create detailed graphs.

HP AdvanceStack 10Base-T Switching Hub-24R. List price: \$1,339. Hewlett-Packard Co., Palo Alto, CA; 800-533-1333, 415-857-1501; fax, 800-333-1917; www.hp.com. *Circle 952 on reader service card.*

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Port-Switching Hubs



The only hub with eight internal segments, the LANart SegWay Adaptive Microsegmentable Hub proved to be the top performer. Two of the four-segment hubs also showed dramatic performance improvement when load balancing was activated.

What the Numbers Mean

Our tests indicate that intelligent load balancing can make a dramatic difference in port-switching hub performance. With the exception of the Compex FreedomSwitch, the port-switching hub products showed performance increases of over 200 percent after load balancing was activated. The number of internal segments was clearly the most important determinant of performance, as the LANart unit came in first, with a 397 percent performance increase despite its less than optimal distribution of clients among segments (see the diagram). The LANart seemed to distribute clients almost randomly, with one entire segment devoted to one slow client.



The 3Com and HP products, both with four internal segments, showed roughly equal performance after load balancing, though 3Com's performance increase was 11 percentage points greater than that of the HP unit. This may be due to its load-balancing algorithm, which reserved

two segments for fast clients only.

The Compex FreedomSwitch was the worst performer of the bunch, hampered by the fact that it has less flexibility for distributing clients because of its lack of stackability. According to Compex, some of the FreedomSwitches shipped with malfunctioning 100-Mbps uplink ports, which could also account for the unit's poor performance. Unfortunately, Compex did not get us another unit in time for our review.

How We Tested

Our test-bed consisted of 48 clients, 1 server, a switch, and 2 test controller systems. The 48 clients were divided into two teams, one consisting of 10 heavy-traffic-generating clients (fast clients) and the other consisting of 38 light-traffic-generating clients (slow clients). Each team was assigned its own dedicated network interface card on the server. We connected the 48 clients to two

WEBBENCH 1.1	Average Fast Client Throughput		
	Before load balancing (Mbps)	After load balancing (Mbps)	Percent increase
Compex FreedomSwitch	0.19	0.22	16
HP AdvanceStack	0.69	2.13	209
LANart SegWay	0.67	3.33	397
3Com SuperStack	0.67	2.15	221
	BETTER ►	BETTER ►	BETTER ►

Segment configuration before load balancing

Fast clients Slow clients



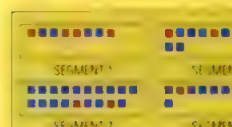
Compex, Hewlett-Packard, 3Com



LANart

Segment configuration after load balancing

Fast clients Slow clients



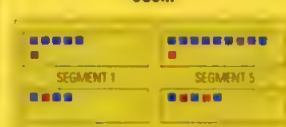
Compex



3Com



Hewlett-Packard



LANart

BALANCING THE LOAD: The graphics below show how each product load-balanced ports among segments for maximum performance.

24-port-switching hubs from each vendor. We made use of 100-Mbps uplinks and switch modules if the hub vendor included them or offered them as options. The hubs, server, and test controller systems were all connected to a SynOptics 28115 10/100 switch.

We used **2D WebBench 1.1** from Ziff-Davis Benchmark Operation to test throughput. First, we manually segmented each hub, placing all of the fast clients on one segment and dividing the slow clients among the other segments. We ran one set of throughput tests to determine baseline performance without load balancing.

We then activated load balancing and ran the throughput tests a second time, keeping track of performance improvements.

Our client machines were Dell Dimension Pro/200n's, each with a single Pentium Pro/200 processor, 32MB of RAM, and a 1GB hard disk. We used a Compaq ProLiant 6000 with two Pentium Pro/200 processors, 256MB of RAM, a 26GB hard disk, and two Compaq NETelligent 10/100 NIC Cards as the server, and running Microsoft Internet Information Server. The test controller systems were Hewlett-Packard NetServer LH Pluses, each with a Pentium II processor, 64MB of RAM, and a 2GB hard disk.—Analysis written by Robert Norton

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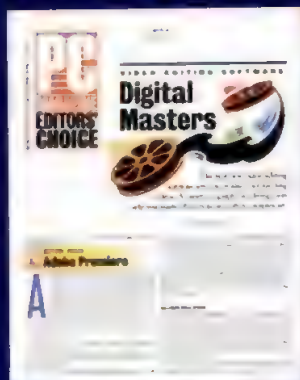
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It's your Internet.™

LANart SegWay Adaptive Microsegmentable Hub

The highest-priced of the port-switching hubs we tested, the \$2,235 SegWay Adaptive Microsegmentable Hub is the only product in this roundup that can divide its 24 ports among eight segments, compared with four segments for each of the other units. As you would expect, with double the segments, it



EIGHT IS GREAT The only hub with eight segments, the SegWay was the top performer by far.

was the best performer of the bunch and showed the biggest increase in performance (397 percent) when we activated load balancing.

The SegWay is also the only product that can perform automatic real-time load balancing without any manual intervention. The FreedomSwitch and SuperStack balance the load only at specific time intervals or if an error threshold is reached.

The ability to stack up to five SegWays together, for a total of 120 switchable 10Base-T ports, makes this product suitable for growing offices. The SegWay hub will also include Web-based management software, but at the time of our testing this software was still in beta. LANart plans to release it by the time this issue is in print.

To install the SegWay, you simply connect your nodes to the front RJ-45 10Base-T connectors and connect the eight RJ-45 connectors on the backplane to an Ethernet switch, a router, or a group of file servers. By default, load balancing is disabled; you can use a terminal, a telnet session, or the front panel to configure the hub segments. A unique joystick on the front panel allows you to perform

Net Tools

SWITCHING HUBS

configuration tasks, including enabling ports, checking status, and even specifying an IP address and subnet mask.

You have two choices for configuring the hub: You can manually assign ports to one of the channels on the back or you can create what LANart calls a logical LAN. A logical LAN is simply a group of segments. For example, in our tests we created four logical LANs, each with two channels or segments. We then enabled load balancing, and the hub did the rest. The SegWay algorithm looks at the traffic on the hub to determine which ports in the logical LAN belong on that LAN's segments. (You can create only one logical LAN if all of the ports are going to connect to the same network or subnet.) Unlike the FreedomSwitch, the SegWay doesn't include an internal Ethernet switch, so you have to attach the eight channels to a third-party switch or router in order for them to communicate. By default, the channels are completely isolated.

We liked the failover feature, a tool for network administrators who can't have any downtime. This feature allows you to set up redundant ports. For example, on our tests, we connected four of the channel ports to one Ethernet switch and the other four to a separate switch connected to the same LAN as redundant spares. When we turned off the power on the first Ethernet switch, the SegWay hub detected the lost connection, and the redundant channels took over automatically without any node losing a connection.

The SegWay is the only product that doesn't come with management software stored on floppy disks. Instead, all of management software is included in the hub. The beta of the software we looked at even included a Web-based management utility. All you have to do is go to any client running a Web browser and type in the name or the IP address of the SegWay hub. From the browser you can view a picture of the hub and the individual port status. You can also create logical LANs, reset ports, and gather detailed information.

If top-notch performance is your primary concern and you're willing to pay a little more than average for a port-switching hub plus and external switch, the SegWay should suit you fine.

SegWay Adaptive Microsegmentable Hub. List price: \$2,235. LANart Corp., Needham, MA; 800-292-1994, 617-444-1994; fax, 617-444-3692; www.lanart.com. Circle 953 on reader service card.

SUMMARY OF FEATURES

Port-Switching Hubs

■ YES ■ NO

Products listed in alphabetical order

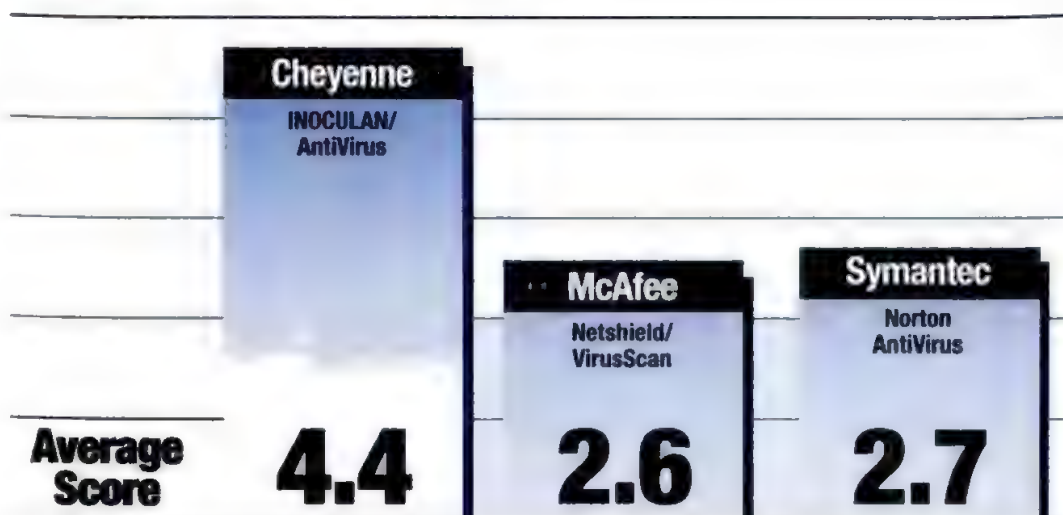
	Compex FreedomSwitch	HP AdvanceStack 10Base-T Switching	LANart SegWay Adaptive Microsegmentable Hub	3Com SuperStack II PS Hub 50
List price of tested configuration	\$1,795	\$1,339	\$2,235	\$1,799
Price of optional 100-Mbps uplink port	\$250 (TX)	N/A	\$100 (FX)	\$349 (TX), \$499 (FX)
Includes Ethernet switch	■	■	■	■
Number of internal segments	4	4	8	4
Stackable	■	■	■	■
Maximum number of stacked hubs	N/A	8	5	10
Maximum number of ports in stack	N/A	192	120	240
Real-time load balancing	■	■	■	■
Forced/timed load balancing	■ ■	■ ■	■ ■	■ ■
Balances based on packet origin and destination/overall traffic	■	■	■	■
Backplane ports	None	4	8	4
Can set up redundant or spare ports	■	■	■	■
Management				
Blocks port access by MAC address	■	■	■	■
Windows-/Web-based management	■ ■	■ ■	■ ■	■ ■
Graphical depiction of hub	■	■	■	■
Traffic statistics per port/per segment	■ ■	■ ■	■ ■	■ ■
Error monitoring	■	■	■	■
Graphics of traffic statistics	■	■	■	■
Supports SNMP and RMON	■	■	■	■
Free technical-support hours (eastern time)	5:00-3:00 M-F	9:00-8:00 M-F	8:00-5:00 M-F	24 hours, 7 days
Warranty	Fans and power supply, 3 years; other components, lifetime	Lifetime (5 years on-site)	5 years	5 years

N/A—Not applicable. The product does not have this feature.

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LAN TIMES SCORECARD



Source: LAN Times July 21, 1997.
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3Com SuperStack II PS Hub 50



With a built-in Ethernet switch, 24 10Base-T ports, an optional 100-Mbps uplink port, and four internal LAN segments, the 3Com SuperStack II PS Hub 50 looks a lot like the Compex FreedomSwitch. The SuperStack even uses the same approach as the FreedomSwitch to do its load balancing. But where the Compex fared poorly on our tests, the 3Com unit was the fastest of the four-segment hubs and showed a whopping 221 percent performance in-



HAPPY TOGETHER The SuperStack puts ports that interact with each other on the same segment.

crease when load balancing was activated. The SuperStack also adds Web-based management software and a powerful Windows-based utility. And whereas the FreedomSwitch isn't stackable, the SuperStack lets you stack up to ten units together, making it much more suitable for growing LANs. The unit also lets you set up redundant ports with failover support. This combination of excellent features and performance earned the SuperStack the Editors' Choice in this roundup.

In view of the fact that it bundles an Ethernet switch, the SuperStack's \$1,799 list price is relatively inexpensive. The 100-Mbps uplink port is an option that costs \$349 for a 100Base-TX version and \$499 for 100Base-FX. The SuperStack is easy to install, but if you want to manage it using the Web or 3Com's Transcend utility, you will need to attach a terminal to the device to supply an IP address. And like the AdvanceStack and SegWay, the SuperStack doesn't enable load balancing by default.

Similar to the other products we tested, the SuperStack lets you adjust several set-

Net Tools SWITCHING HUBS

tings to suit your security concerns. You can force a port to work only with a specific MAC address or take a port out of the load-

balance configuration so it never moves. You can also set up all the segmentation yourself and disable load balancing.

The Ethernet switch included with the SuperStack provides five ports. Four of the ports are reserved for 10Base-T, and the fifth is used only if you purchase the optional 100-Mbps uplink. You can also configure any of the ports to serve as redundant failover connections. If a port connected to an important device such as a file server fails, the redundant port will automatically take over without any loss of data. The AdvanceStack and the SegWay also offer this feature.

Like the FreedomSwitch, the SuperStack uses information on the source and the destination of a packet to determine the best way to load-balance. For example, if several ports are constantly sending and receiving data to a single port, the load-balancing feature will determine that these ports should be placed on the same segment. The SuperStack provides three ways to configure load balancing. You can manually force the hub to balance from the management software or a terminal connection, you can configure the hub to load-balance automatically at a preset time, such as every hour or every day, or you can configure the hub to load-balance whenever a threshold is exceeded. On our tests, we set up a threshold of 70 percent utilization on a segment to activate load balancing.

Our favorite feature of the SuperStack is its Web-based management utility. From any PC with a Web browser, you can type in the address of the SuperStack and perform all of your configuration tasks. You can also see a graphical representation of the hub, complete with the ports that are in use and which segments are connected to them. The utility uses Java applets to create graphs of different statistics, including utilization, traffic, and any errors. In case you don't want to use a Web browser, the bundled Transcend Quick Configuration Manager provides the same graphical information and will run on any Windows-based PC. Like the other products, the SuperStack also includes SNMP agents, which you can manage from a SNMP management console.

SuperStack II PS Hub 50. List price: \$1,799. 3Com Corp., Santa Clara, CA; 800-638-3266, 408-764-5000; fax, 408-764-5001; www.3com.com. Circle 954 on reader service card.



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Net Tools

FROM THE BENCH

NETWORK DESIGN TOOLS

Mastering the Plans

By Robert P. Lipschutz

To do a proper job, you need the proper tools, and designing your network is no exception. The two network design tools in this roundup, ImageNet's CANE 2.0 and NetSuite Advanced Professional Design, not only assist you in designing your network but may even teach you something about the network.

What separates these products from simple network drawing tools are the products' built-in knowledge of specific network devices (such as routers, hubs, and switches). This is used to validate your network's design, from the application layer down to the cable layer.

Additionally, both tools include extensive properties sheets on devices that catalog specific product information, such as firmware revision, serial number, and technical-support information. If you diligently record this data, you'll always have the right information to plan and budget for your network. To aid in this task, both products offer optional auto-discovery utilities for ferreting out devices on your network.

Both tools require a substantial up-front effort to diagram your networks accurately, but once you're done, you might actually enjoy handling network upgrades and design changes.

ImageNet Ltd.

CANE 2.0

For those who are about to design a new network or are just trying to get a handle on an existing one, the network modeling tool CANE 2.0 (\$9,995 list) intelli-

gently handles design from the physical layer all the way up to the application layer and, in the process, validates all network connections. We found CANE helpful on many networking levels, but we also encountered some annoying delays when importing devices into its library.

Designing your intelligent network with CANE is similar to doing so with NetSuite Advanced Professional Design. You place components of your choice from the Device Library into your workspace, define the attributes of the components, and then define the relationships between devices in the network.

When we designed our test network, we dragged a hub, some desktops, and a file server onto the drawing area, then connected them to an Ethernet hub. CANE allowed us to connect only objects that contained like functions. We couldn't make connections from a hub to a Token-Ring adapter.

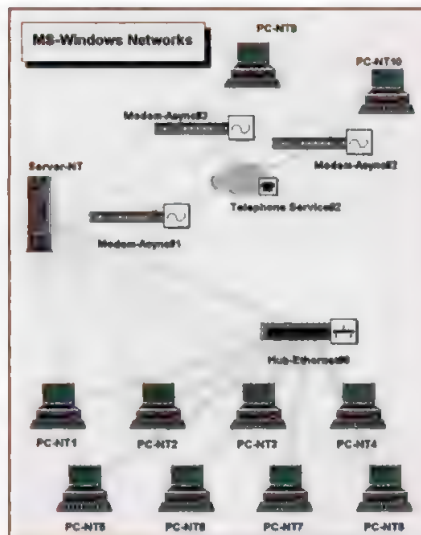
Devices can be connected at any of seven layers of the well-known OSI model. Different colors designate physical, data, network, and application links. CANE also provides a mechanism that lets you display only the layer or layers that you are interested in viewing. This feature was useful when we designed our network.

Similar to NetSuite, CANE

provides a validation utility for your network design that verifies the connections at the physical, data link, network, and application layers. Using this feature let us be more confident of the feasibility of our test design.

To create your network, CANE uses a wide range of vendor-specific devices stored in the ObjectStore database. A subset of these devices called the Device Library resides on your hard disk when you install CANE. Each device in the library contains an extendible set of general and device-specific attributes, including vendor details, dimensions, attachable plug-ins, and pricing.

Additional devices can be imported from the product CD. We found that importation is slow: It really hindered our progress. Granted, we were using only a PC with a 90-MHz Pentium processor. But ImageNet promises that CANE 2.5 will have a faster device-import utility.



COLOR ME USEFUL: CANE displays the network-level connections in different colors.

ty. Also, if devices are not available in the database, you can create your own device.

CANE has two time-saving features we found useful for larger network designs. One is the product's ability to do bulk replacement of objects within your architecture; the other is its ability to update devices in your design when you update the device

within the Device Library.

CANE generates reports, including bills of materials, IP allocation summaries, and more. The attributes included in these reports are stored in Access databases and can be exported to standard spreadsheet applications for further manipulation. We would have liked to have seen a facility for editing these reports within the application.

Other helpful utilities included with CANE are a simulation engine that lets you test your network designs for potential bottlenecks, an IP planner module that helps with the often mystical art of IP address allocation and subnetting, and an optional auto-discovery package (\$3,995 list). **CANE 2.0.** List price: \$9,995. ImageNet Ltd., Saratoga, CA; 800-665-2263; fax, 408-863-7265; www.imagenet-cane.com. Circle 956 on reader service card.

NetSuite Development

NetSuite Advanced Professional Design

Showing uncanny attention to detail with an exhaustive set of network devices and a rich set of canned reports, NetSuite Advanced Professional Design seems to have all the bases covered. This network design tool starts at \$2,500 for the base package; it also offers a robust set of optional tools, including the Crystal Reports tool for creating any imaginable report, an IP-planning utility, and a Web-export utility for creating read-only network views.

As with CANE, designing your network with NetSuite involves dragging devices such as hubs, routers, PCs, and servers from the device database to the work area. Organized by vendor, the device database can be placed anywhere on the desktop and collapsed to save space. We dragged frequently used devices to palettes on the desktop, and we were also able to create custom devices and add them to the device palette. Media and protocol palettes are available and can

Net Tools

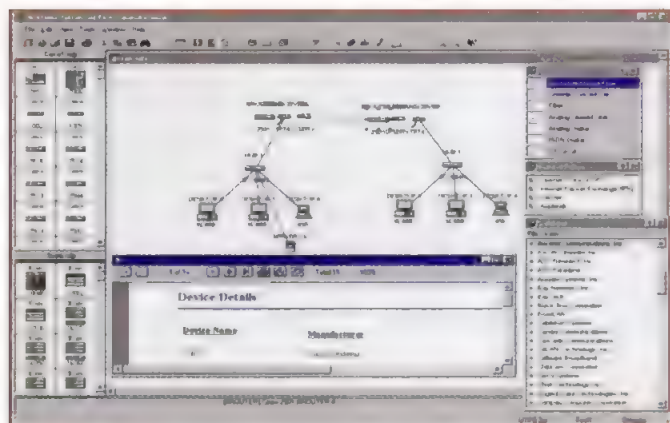
FROM THE BENCH

be put on the desktop for added convenience.

NetSuite includes a vast database of network and computer devices, including products from Cisco, Compaq, 3Com, and other vendors. Some newer models are absent, but you can subscribe to get monthly device updates from NetSuite's Web site.

Each device in the database has its own set of general and custom properties. NetSuite provides data, such as the number of slots or ports on a router, when it can; it also has fields for your own data. The more data you enter about your devices, the more useful the reports you generate will be.

Like CANE, NetSuite can validate your network design on multiple layers. At the physical layer, you can monitor cable lengths to make sure a Fast Ethernet hop is less than the maximum of 100 meters. At the data-link layer, NetSuite gives warnings when you are trying to connect incompatible devices—for example, connecting a hub to the serial port of a router. Validation also occurs at the network layer and prevents you from mismatching network protocols.



EASY ACCESS: NetSuite lets the user place various design palettes close to the workspace, for added convenience.

On the administration side, we found NetSuite's ability to create bills of materials and work orders very useful. When we finished creating our test network, the materials list included each piece of equipment with its specific vendor and model number. Even the required media

were listed. If you design your network to scale, NetSuite tells you the amount of cabling to order. The work order describes exactly how to connect each of the devices together and goes down to the module and the port level on the network devices.

Available separately or as a bundle are Professional Audit 3.0 (\$2,000 list) and Toolkit 3.0 (\$1,000 list). You can use the audit package and its included probes to discover SNMP network devices automatically. Professional Audit also can extract network device information from management systems such as HP OpenView, Intel's LANdesk, and Microsoft SMS.

Toolkit includes a Web publisher for creating browser-viewable network designs, an IP Planner for creating networks and subnets, a floor-plan designer, Crystal Reports for even more interesting reports, a simulation gateway to CAC, and a device foundry with which you can cre-

ate your own smart devices. **NetSuite Advanced Professional Design 3.0.** List price: \$2,500; with Professional Audit 3.0, Toolkit 3.0, one-year library, \$6,075. NetSuite Development, Wayland, MA; 800-638-7848; fax, 508-647-3112; www.netsuite.com. **Circle 957 on reader service card.**

ISDN ADAPTERS

Serving Up ISDN

By Les Freed

Adding a new dimension to the ISDN terminal adapter arena, Eicon Technology's Diva Server BRI (\$700 list) is an ISA card that not only combines an ISDN terminal adapter with two DSP-based analog modems but also allows each B-channel to operate independently. The ISDN/analog combo means you can dial into or receive calls from virtually any device that can connect to a phone line. But the B-channel feature—unique among the current crop of ISDN adapters—takes flexibility to the next level. We used the Diva to dial out to an Internet service provider (ISP) on one B-channel while simultaneously answering an incoming call from a remote laptop computer on the other B-channel.

But the Diva Server BRI is missing two things we've come to

expect from internal ISDN adapters. First, the card doesn't have an RJ-11 jack, so you don't have analog voice phone support. Second, the Diva uses an ST interface instead of the more common U interface. The ST interface lets you share an ISDN line among devices, but it requires an external NT-1 ISDN line interface. The external NT-1 adds expense and cable clutter, and the line requires its own AC power supply, which also adds to the clutter. Eicon is working on a U-interface version of the Diva Server BRI.

The Diva's two DSP-based modems let it communicate with any combination of ISDN, analog, or fax modems on either B-channel; however, the firmware on the modems is currently limited to 14.4-Kbps connections. Eicon released 33.6-Kbps firm-

ware for beta testing as we went to press, and an Eicon representative told us that the company plans to support the forthcoming ITU 56-Kbps modem standard when it becomes available sometime next year. Designed primarily as an ISDN adapter for servers, the Diva Server BRI works with Microsoft Windows 95, Windows NT, and Novell's NetWare. We tested the card under Windows 95 and Windows NT Server 4.0.

In both cases, the product installs as a LAN card, and the driver software provides a virtual modem that can be used with Windows NT's Remote Access Service (RAS) or Windows 95's Dial-Up Networking.

The plug-and-play Diva Server BRI requires only a single IRQ line and a small block of I/O addresses. Installation on either platform is performed by an all-in-one installer program provided on the Diva's software CD. If you need more than two simultaneous connections, you can stack up to four Diva cards—connected to four ISDN lines—in a single machine.

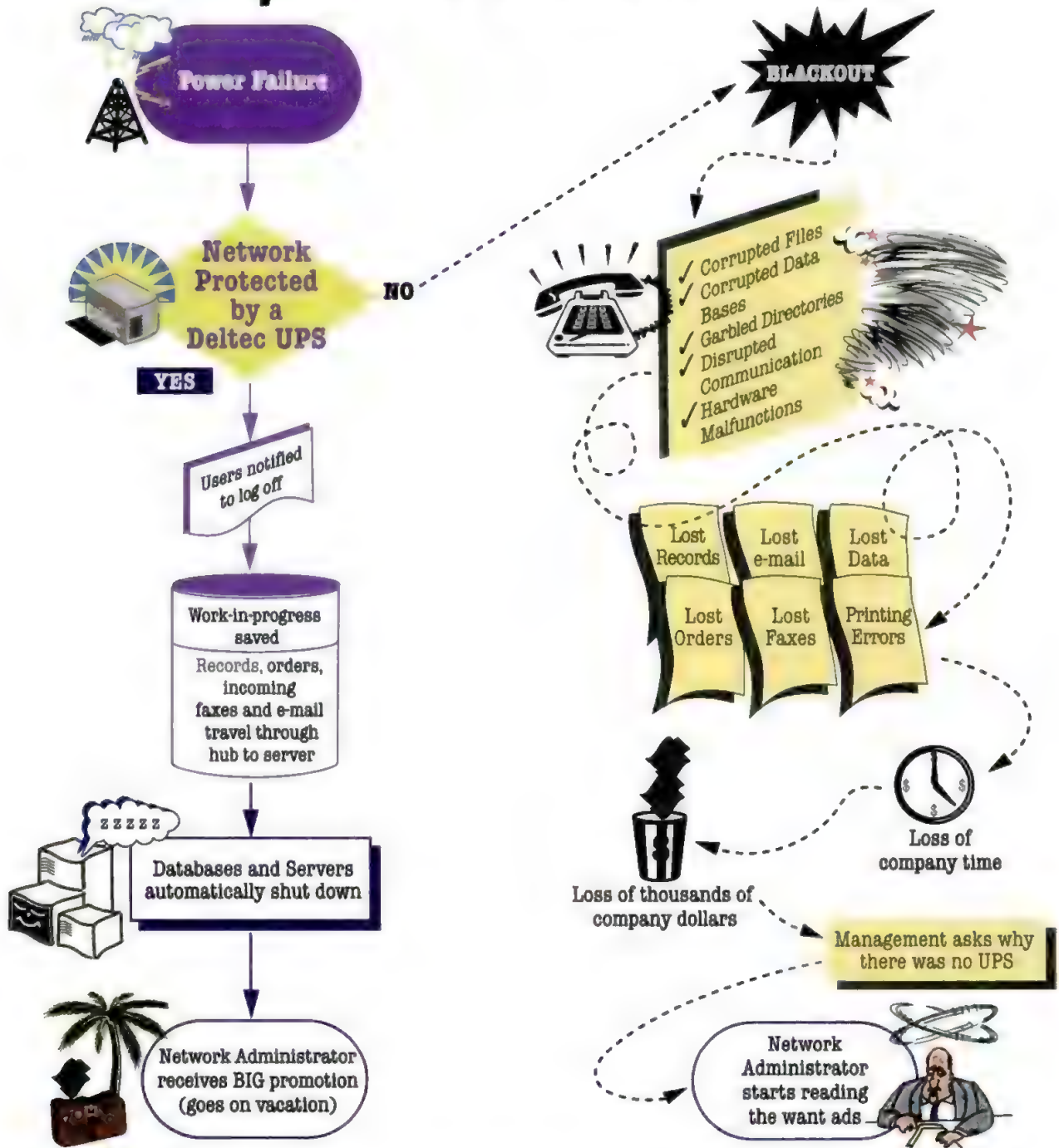
Despite Eicon's emphasis on server-based applications for the Diva Server BRI, we found the Diva's Windows 95 drivers to be very complete. Eicon supplies ISDN, analog-modem, and fax drivers for the Diva card. The drivers let you use the Diva with Dial-Up Networking, Hyperterminal, and other general-purpose communications software and fax programs.

Diva Server BRI. List price: \$700. Eicon Technology Corp., Dallas; 800-803-4266; www.eicon.com. **Circle 958 on the reader service card.** **PC**

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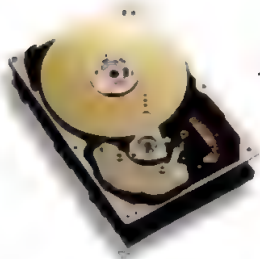
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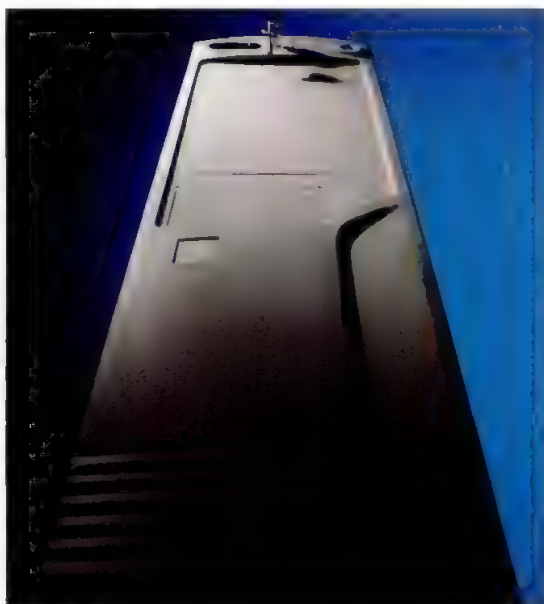
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Net Tools

INTERNET TOOLS

H.323 STANDARD

Videoconferencing on the Net

By Don Labriola

H.324 POTS videophones may be all the rage these days, but the corporate world has always been more interested in models that work over LANs, intranets, and the Internet. Obstacles to cheap, reliable network videoconferencing still exist, but the good news is that the most formidable hurdle—the lack of cross-vendor compatibility—is no longer as insurmountable as it once was. The International Telecommunications Union's recent H.323 recommendation has already begun to spawn fully interoperable network videoconferencing equipment, just as its H.320 predecessor did for ISDN-based systems earlier this decade.

NOT AS EASY AS IT LOOKS

Audio/video streams can stand a fair amount of data loss without becoming unintelligible. After all, most multimedia compression algorithms throw out more bits than they keep. But each video frame and sound sample has to arrive in time to be played in the correct sequence.

Packet networks, which are designed for applications such as e-mail and distributed database systems, simply don't meet these requirements very well. They incorporate high-overhead error-correction protocols to ensure that every bit arrives intact but often introduce random delays and are constantly juggling each user's bandwidth allocations. The resulting throughput fluctuations and variable transmission times can wreak havoc with real-time multimedia applications.

H.323 TO THE RESCUE

The solution to these problems is H.323, the latest and most far-reaching of the ITU's family of H.32x videoconferencing standards. Ratified in 1996, the new standard extends H.320-style benefits to enterprise networks, Ethernet and Token-Ring LANs, TCP/IP intranets, FDDI, frame relay, and even the Internet.

Like its siblings, H.323 specifies mechanisms for compressing and transmitting real-time video, voice, and data between a pair of videoconferencing workstations. It also defines signaling protocols for managing audio and video streams, as well as procedures for breaking data into packets and

synchronizing transmissions across one particular type of communications medium.

But H.323 goes farther than standards like H.320 or H.324, because it specifies optional components such as network administration modules—multi-standard gateways that provide paths to noncompliant equipment, and multipoint control units that control sessions with more than two participants. (To see how these components might work together on a typical network, see the diagram "H.323 in the Enterprise.")

H.323 has potential applications ranging from standalone and PC-based videophones to complex enterprise-wide videoconferencing networks. It also defines devices such as speech-only network telephones, since the standard mandates support only for voice communications, specifying video and data conferencing capabilities as options.

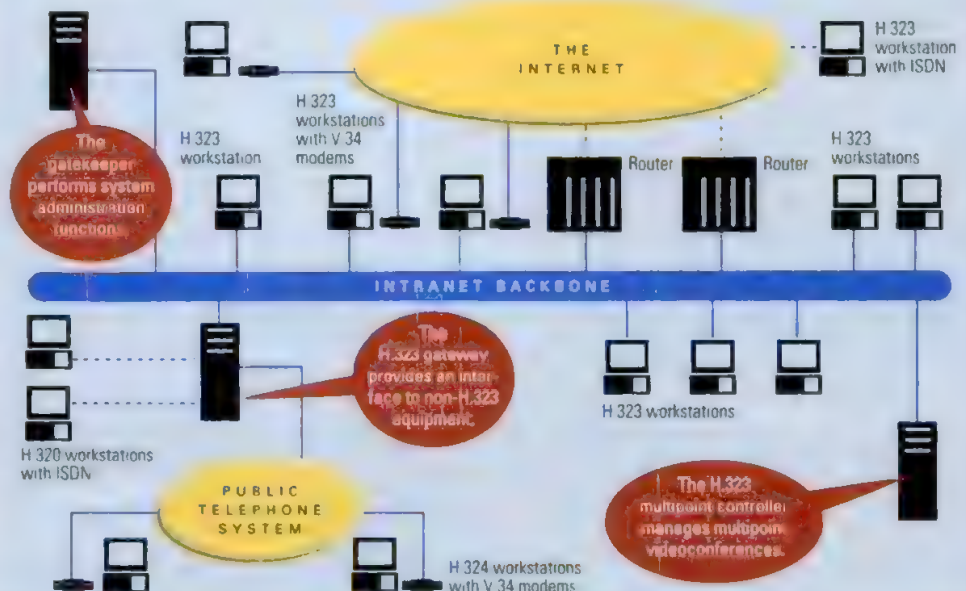
One key component of H.323 that makes this all possible is the Realtime Transport Protocol, which was originally introduced by the International Engineering Task Force (IETF), an organiza-

tion of network designers, vendors, and users that defines standards for the Internet. RTP is a low-overhead data-transfer protocol that helps reduce variable delays by time-stamping each packet of data. This allows RTP-compliant delivery systems to assign higher priorities to time-critical audio/video packets and to reassemble them at their destinations in the correct order. Though this won't ensure real-time performance when there aren't enough resources available to handle a video stream, it does at least provide the tools to do the job if a network has spare capacity.

Another integral part of the H.323 workstation spec is the H.263 video compression/decompression standard (codec), which is an algorithm that converts a camera's analog video stream into digital data, compresses it, and then reverses the process at the destination terminal. H.263 is a revised version of H.320's original H.261 codec, which standardized videoconferencing over circuit-switched digital lines like ISDN. But unlike its predecessor, H.263 is tuned for high performance at the relatively low data rate of a

H.323 in the Enterprise

H.323's flexible architecture supports a wide range of complex videoconferencing networking topologies.



dial-up connection. H.263 is also efficient enough to run on a mid-speed Pentium processor without requiring the pricey hardware accelerators that made H.261 so expensive to implement. A variety of software-only H.323 network videophones are already available for processors as slow as a 75-MHz Pentium.

H.323 defines several audio codecs, each of which is tuned for a different type of audio data and transmission speed. The most prominent is the speech-optimized G.723.1, which the International Multimedia Teleconferencing Consortium's Voice Over IP (V/IP) Forum recently selected as the default codec for Internet telephony applications. G.723.1 consumes only about 6 Kbps of bandwidth and reproduces audio up to 3 kHz, which easily provides the frequency response needed for toll-quality telephone calls.

THE INTERNET CHALLENGE

Neither H.263 nor G.723.1 delivers MTV-quality output over a 33.6-Kbps modem connection. But with a steady stream of data at that speed, they can produce an illusion of motion and intelligible speech at H.263's 96-by-128 SQCIF resolution. Unfortunately, the Internet rarely provides consistent throughput. As anyone who has surfed the World Wide Web can attest, even higher-speed connections can be plagued by aggravating delays and bandwidth fluctuations.

A major part of the problem is the fact that the Internet is essentially an unadministered network, with no centralized mechanism for connection management. Sessions are routed through seemingly random successions of servers and rarely take the most efficient path. If your data hops onto a server that's already overloaded by other users,

Net Tools

INTERNET TOOLS

your screen will probably freeze until conditions improve.

Not surprisingly, few of today's H.323 videophones produce frame rates in excess of 3 to 5 fps on the Internet, and some generate output better measured in frames per minute. For most users, high-quality Net videoconferencing that delivers 24-fps full-motion video is at least a few years off. The Internet is likely to remain a hostile environment for live video until higher connection speeds and several recently proposed IETF infrastructure mechanisms become widely implemented. These upcoming standards include the ReSource reservation Protocol (RSVP), which will let routers guarantee bandwidth to videoconferencing sessions, and the Host Proximity Service (HOPS), which automatically routes connections through the most efficient sequence of servers.

BACK TO THE LAN

Videoconferencing over a managed network like an Ethernet LAN or TCP/IP intranet is a more promising scenario than trying to conduct a session on the Internet, especially when RSVP-compliant routers have been installed. But it's still a challenging task. Intranets provide many times the bandwidth of a typical dial-up Internet connection. But without specialized network-management software, conducting more than a few sessions over even a 100-Mbps backbone can result in degraded video quality and delays for nonvideo users. Luckily, H.323 includes specifications for user and bandwidth management (see "H.323 in the Enterprise").

The H.323 Gatekeeper specification describes a standard toolkit that lets system administrators

regulate H.323 user access to the network, manage the bandwidth allocated to each video stream, and monitor each session's resource consumption.

H.323's Gateway module lets H.323 devices connect to equipment compliant with other H.32x recommendations. The ITU allows some flexibility in the way that Gateways can be implemented, but most will probably be packaged as standalone PC-based servers. Through a combination of

H.323 network videophones are available for processors as slow as 75 MHz.

software and hardware interfaces, these devices let H.323 equipment communicate with devices such as H.324 POTS videophones and H.320 ISDN-based boardroom videoconferencing systems. This function is expected to be crucial for companies that already maintain complex internetworks of Ethernet LANs, in-

tranets, dial-up and network-based Internet interfaces, and WAN connections to ISDN and leased lines.

H.323 also describes a multipoint controller unit that can link together more than two H.323 users into a single conference. Unlike other H.32x recommendations that don't explicitly define such functionality, H.323 fully integrates multipoint capabilities with its other components. This makes possible sophisticated conference topologies that mix multiple video, audio, and data conferencing applications running over a variety of media. This capability should be especially attractive to firms that already support a network of boardroom videoconferencing systems, making it possible to add ad hoc combinations of network, Internet, and dial-up users to ISDN conferences.

Although few compliant products other than consumer Internet videophones are yet on the market, H.323 is well positioned to become the dominant standard for network conferencing by the end of the decade. **PC**

H.323 in a Nutshell

The H.323 standard is actually a combination of many other standards and components.

H.225	Specifies mechanisms for synchronizing data and bundling it in packets on packet-switched networks.
H.245	Specifies control protocols and signaling procedures for managing audio/video streams.
H.261	Video codec algorithm, included for backward compatibility with H.320.
H.263	New video codec for POTS and packet-switched networks.
G.711	Audio codec for voice communications up to 3.1 kHz; can use 48, 56, or 64 Kbps of bandwidth.
G.722	High-quality audio codec for voice communications up to 7 kHz; can use 48, 56, or 64 Kbps of bandwidth.
G.723.1	Low-bandwidth audio codec for voice communications up to 3.1 kHz; can use 5.3 or 6.3 Kbps of bandwidth.
G.728	Audio codec for voice communications up to 3.1 kHz; uses 16 Kbps of bandwidth.
G.729	Audio codec for voice communications up to 3.1 kHz; uses 8 Kbps of bandwidth.
T.120	Suite of standards that describe data-conferencing and application-sharing functions.
Gateway	Standardizes network administration functions such as bandwidth management and LAN-access control.
Gatekeeper	Specifies interface to H.310, H.320, H.321, H.322, and H.324 videoconferencing equipment.
Multipoint controller	Permits H.323 systems to participate in sessions that contain more than two participants.
4CIF, 16CIF, FCIF, QCIF, SQCIF	Video screen formats defined by H.263. The most common format used by Internet videophones is SQCIF (128-by-96 resolution). Most LAN systems add QCIF (176-by-144 resolution) and FCIF (352-by-288 resolution).

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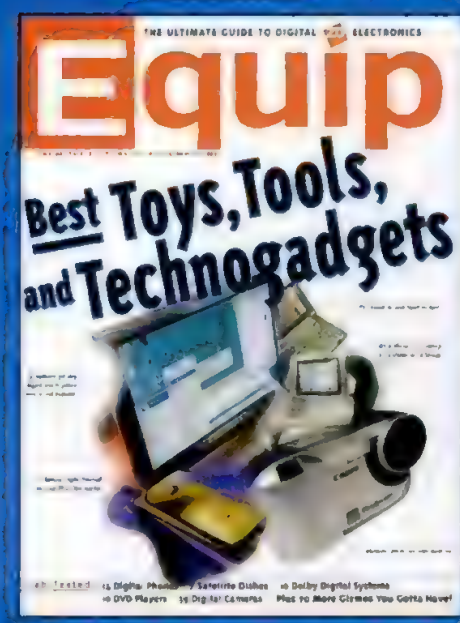


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PC Tech



Database Connectivity And the Internet

Active Server Pages and Remote Data Service.

By John Lam

The brief era of static Web pages is drawing to a close. As the novelty of merely having a Web presence wears off, companies are beginning to focus their attention on building useful Web sites. Perhaps the most useful application of a Web site is publishing a company's data to its customers.

Unfortunately, publishing data on static Web pages is a maintenance nightmare for sites larger than a few HTML pages. If a company is publishing its data as HTML, someone ultimately has the task of ensuring that all those HTML pages are kept up to date. For example, changes in pricing information for a company's products must be manually transcribed from the pricing database to the HTML pages in the catalog. Wouldn't it be great if changes in pricing data were automatically reflected in the catalog's HTML pages? Wouldn't it also be great if your customers could update and manipulate selected data? For example, a customer might use a Web page to update his shipping address and

contact information. For these scenarios, we need to know how to generate *dynamic data* and how we can manipulate *live data*.

Luckily, feverish competition within the Internet software industry has generated a number of different solutions that try to meet these needs. In this column, we'll focus on one that uses Microsoft's Internet Information Server (IIS) and Active Server Pages (ASP). Welcome to the era of *dynamic and live data*.

INTERNET INFORMATION SERVER

Internet Information Server, Version 3.0, is really a family of related server products. At its core is the HTTP server, which is responsible for dispatching HTML pages in response to incoming requests from Web browsers. There are also a number of supplementary servers that manage indexing of Web pages, streaming multimedia content over the Web, and maintaining interfaces with data sources. With IIS 4.0, several additional servers will join the IIS product set (see the sidebar "IIS 4.0: The Trans-

INSIDE

TUTOR: Setting up a Windows 95 network is not as daunting a task as you may think. Neil Randall explains Direct Cable Connection, network interface cards, and everything else you need to know. *Page 259.*



POWER PROGRAMMING: Visual InterDev and Active Server Pages are keys to making your Web site dynamic. A sample site illustrates these technologies, which are also described in this issue's PC Tech feature. *Page 265.*



UTILITIES: Document files with embedded OLE files may be robbing you of hard disk space. This issue's utility, Unfrag, recovers the lost megabytes for you. *Page 275.*



PC SOLUTIONS: Reserve a drive letter for your CD-ROM so that it stays the same; print first and last page numbers for report groups in an Access database; and more. *Page 293.*



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actional Web Server" for further details).

A typical IIS installation for generating dynamic and live data for publication to Web browsers is shown in the diagram "Generating Dynamic Data." The key elements of IIS that concern us here are the HTTP server and the database connectivity components. The HTTP server handles incoming requests for data as the user browses a file on the Web server. If that file is an active server page, it will execute the code within that page. If the ASP code is manipulating database data, the HTTP server will dispatch those calls to the database connectivity components.

From an ASP file, you will typically talk to a database via the ActiveX Data Objects (ADO) layer. ADO is implemented on top of Microsoft's new database API, OLE DB, which currently talks to existing ODBC databases through the ODBC engine.

Future versions of OLE DB will have data providers supporting specific database products, such as Microsoft SQL Server, thereby eliminating the need to dispatch calls through the ODBC engine. For now, however, the only OLE DB data provider that ships with IIS is the ODBC data provider.

From code running in a Web browser, you can talk to remote databases using Remote Data Service (RDS). The RDS components handle incoming HTTP-based database queries and dispatch them to the appropriate database using the OLE DB layer. RDS then takes the results of those queries, constructs a disconnected data set, and transmits the data set using HTTP back to the client Web browser.

In this article, we will take a look at how you can construct a dynamic Web site with IIS. From a bird's-eye perspective of ASP and RDS, you'll see the first steps you'll need to take to implement solutions employing these technologies.

ACTIVE SERVER PAGES

An active server page makes dynamic data possible. It contains a set of instructions that are processed by IIS on the Web server. The instructions can manipulate any number of server-side ActiveX components that are typically used to access data or implement business rules. In most cases, the ASP code returns the results of the server-side processing by dynamically generating an HTML page. As we will see, the combination of the scripting language, programmatic access to ActiveX components, and the ability

to generate HTML on the fly make ASP a powerful technology for building dynamic Web sites.

What makes ASP so useful is that it is a browser-independent technology. No matter which browser—Internet Explorer, NCSA Mosaic, or Netscape Navigator—visitors to your site are using, your ASP code generates

initialized, IIS begins executing the code in your ASP file.

A user's Web browser can pass parameters to your ASP code through the file request command line. The arguments are processed by IIS and stored in a Request object that can be accessed by the code in the ASP page. For example, the HTTP GET request <http://www.iun-known.com/story.asp?StoryID=5> tells IIS there is a named argument called StoryID and its value is 5.

The processing phase begins once IIS has initialized the Session and Request objects. IIS executes the ASP code and interacts with various databases or other ActiveX components according to your instructions. As IIS extracts and processes data from your ActiveX components, it can also generate the HTML page that will be sent back to the user's Web browser.

After your ASP script finishes executing, the response phase begins. At this point, IIS again steps in to package the HTML page to ship back to the user's Web browser. Your page can contain anything that can be included in an HTML page. The one thing that it cannot contain, however, is *live data*. We will see later how Remote Data Service lets us solve this problem.

SCRIPTING LANGUAGES

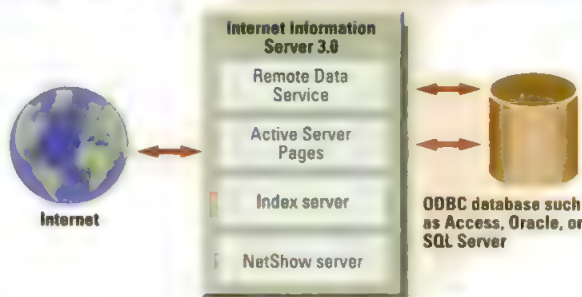
The code in an active server page can be written in either of the ActiveX Scripting languages that ship with IIS: VBScript or JScript. The ActiveX Scripting component of IIS interprets the ASP code at run time. If you are familiar with Visual Basic or Java, the scripting versions of these languages will be familiar to you. For the sake of simplicity, we will focus here only on VBScript.

Compared with Visual Basic, VBScript has some significant limitations. There are no explicit types such as strings or integers in VBScript; all data types must be *variant*s. Also, since VBScript was intended to be a *safe* subset of Visual

Basic, you cannot perform file I/O, nor do you have direct access to the underlying operating system via API calls. However, since VBScript allows you to manipulate ActiveX components directly, you can implement features not directly available through VBScript by using these components.

The one limitation that developers will be most concerned with in the current version of IIS is the lack of debugging support, which makes it much more difficult to write and

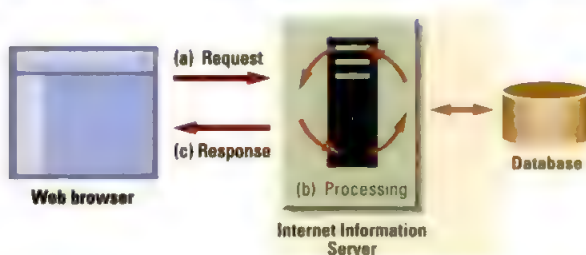
GENERATING DYNAMIC DATA



HTML. If there are specific HTML differences among the different Web browsers that you would like to exploit in your Web application, you can obtain information about the browser type from IIS and generate a different HTML page for each browser type.

The diagram below shows the life cycle of an ASP page. We can break this life cycle into three distinct phases: the request, the processing, and the response. If you've used Common Gateway Interface (CGI), you'll find this very familiar. The request phase represents the initial point of contact between the user's Web browser and your ASP file. The user acti-

LIFE CYCLE OF AN ASP PAGE



vates the ASP code by browsing into the file that contains your code (usually identifiable by its .asp filename extension). The first time a user visits your ASP application, IIS creates a Session object you can use to manage that user's context within your ASP application. If the user has already visited another ASP file in your ASP application (we'll see below what constitutes an ASP application), IIS will update the state of the user's existing Session object. Once the Session object has been

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debug ASP scripts, since you get only the cryptic error messages that appear in a user's Web browser when things go wrong. However, the next version of IIS addresses this problem with the inclusion of the Script Debugger.

BUILT-IN OBJECTS

An ASP application consists of all ASP files that are located within an IIS virtual directory or any of its subdirectories. The scope of some of the built-in scripting objects is bounded by this notion of an application.

In addition to the Request and Session objects noted earlier, you'll frequently need to deal with three additional IIS objects in your applications: the Response, Application, and Server objects. Each of these objects contains properties that an ASP application needs to read or manipulate at run time.

The Server object consists mostly of a set of utility functions you can use within your ASP application. If you are creating new ActiveX objects on your server for use in your ASP application, you'll be calling the CreateObject member function of the Server object on a regular basis. For example, if you want to create an instance of the AdRotator object available from Microsoft, you'll write the following VBScript code:

```
Server.CreateObject
("MSWC.AdRotator")
```

CreateObject takes a string known as a *programmatic identifier* or ProgID. This ProgID is mapped using the Registry on the IIS Server machine to find the code for the MSWC.AdRotator object.

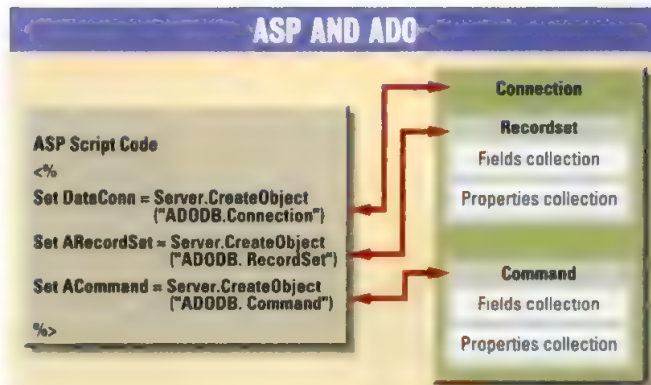
The Application object is used to store application-wide parameters for all users of your Web application. You can manipulate the Application object through the global variable Application. As with all of the objects in your ASP application, you can use this object as a convenient place to store properties. For example, if you wanted to specify a custom greeting for users using your ASP application, you could set a string called Greeting to the text of your custom greeting:

```
Application("Greeting") = "Thanks
for dropping by the IUnknown.com web
site."
```

Anytime your ASP code wants to reference this greeting, you can retrieve its value from the Application object using the following line of ASP code:

```
<%=Application("Greeting")%>
```

The delimiters <% and %> have a special meaning: The script engine executes any text that is enclosed within them.



The Session object is used to define the application context of a single user. You can use the Session object to store properties that are unique to each user who is currently interacting with your ASP application. One possible use of Session objects is to track a user's path through your Web site. For Session objects to work correctly, however, your users must allow IIS to write cookies into their browsers. IIS uses cookies to identify users each time they reconnect with your Web site.

Without the cookies, IIS is unable to distinguish one user from another.

A Session expires after a certain period of time. By modifying the Timeout property of the Session object, you can change this time period from its default value of 20 minutes. This allows you to distinguish between a user's reconnecting to your ASP application during a single trip to your Web site and making separate visits to your ASP application.

The Request object contains a processed list of parameters that are sent from your user's Web browser, and you can retrieve the values of each named parameter by querying

the Request object. For example, suppose a browser sends the following URL request to IIS: `http://yourasp.asp?firstName=John&lastName=Lam`. To retrieve the firstName parameter, all you have to do is call the QueryString method of the Request object:

```
<%= Request.QueryString
("firstName")%>
```

You will interact with the Response object to generate the HTML code that will be shipped back to the user's Web browser. While you can explicitly write values out into the response stream (as our previous examples all have), you can also use the Write method to achieve the same effect. The Response object also allows you to write custom cookies to your user's Web browser, redirect incoming calls to a new URL, and write entries into the Web server log file.

DATA ACCESS

Perhaps the most important feature that ASP brings to the Web developer is access to data stored in relational databases, encapsulated behind the ActiveX Data Objects object model. Developers who are used to the Data Access Objects object model in Visual Basic will feel right at home using ADO, since the two strongly resemble each other. How ADO relates to your ASP code is illustrated in the diagram "ASP and ADO."

As I mentioned above, ADO is built on top of OLE DB, and at this writing,





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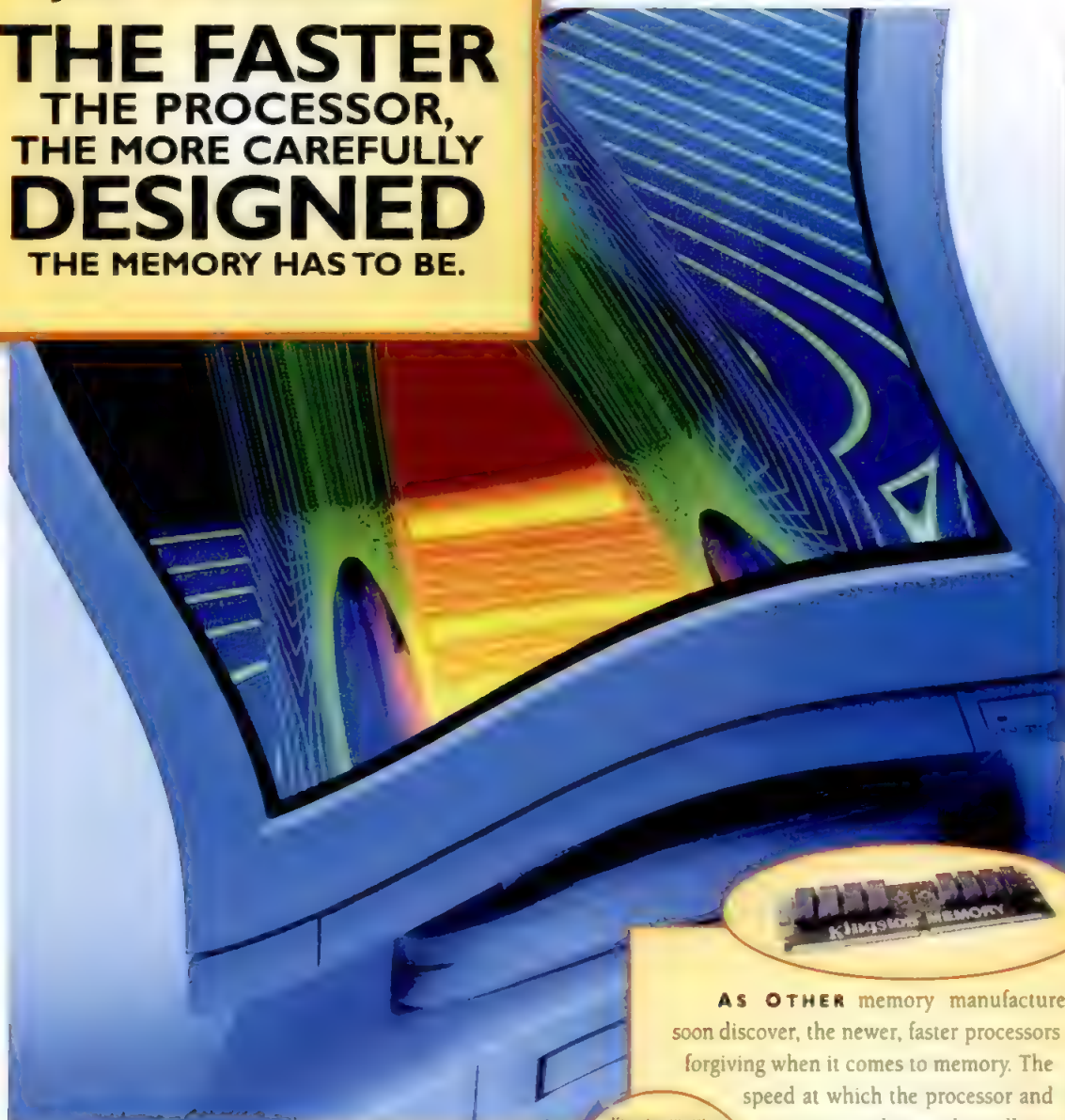
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the only data provider available for OLE DB is ODBC. So you can programmatically access any ODBC database using ADO with only a minor performance hit. In the near future, an OLE DB data provider will allow your ASP applications to connect directly to SQL Server. All you'll have to do will be to plug in the SQL Server OLE DB data provider, and you'll immediately gain higher performance without requiring any modifications to your ASP code.

This issue's Power Programming column walks through the creation of the IUnknown.com dynamic Web site, which uses SQL Server 6.5 and ADO, and offers a detailed discussion of the ADO object model.

SCALING ASP APPLICATIONS

When you create your first ASP application, you will likely place most of the application logic within the ASP file itself. When you're just getting started, this is not necessarily a bad choice. But it's not particularly desirable for large applications, since you can't reuse any of the code in another ASP file. As your ASP application grows and you want to share or reuse code across several ASP files, you'll want to place your code inside one or more ActiveX objects. You can create these ActiveX objects in your programming language of choice; today it could be C++, Delphi, Java, or Visual Basic. As long as the ActiveX object you create is compatible with Automation (which means that it supports method calls using the IDispatch COM interface), you will be able to manipulate that object from your ASP application.

As your Web site grows in popularity, you'll need to consider a number of other issues. Initially, you may be manipulating the data in your database using ADO method calls such as Add or Update on the Recordset object. However, the simplicity inherent within these method calls does not come without a cost. As you begin to scale your ASP application, the method call overhead of using ADO becomes significant. One way to help scale your application is to batch your database operations and commit them using SQL update queries, via the ADO Command object.

You'll also need to consider the cost of maintaining a connection to your SQL database. *Connection pooling* allows IIS to create a pool of ODBC connections and dispense them as required by your ASP

applications. You avoid the authentication overhead associated with establishing an ODBC connection each time you want to access your data. Note that connection pooling is not turned on by default in IIS 3.0; refer to the product documentation for details on enabling this feature.

REMOTE DATA SERVICE

We noted earlier that ASP generates only HTML and thus can't expose live data to the user. To remedy this problem, Microsoft developed a very interesting piece of technology

known as Remote Data Service (formerly known as Advanced Data Connector or ADC). At the core of RDS is the notion of a *disconnected data set*. In the world before disconnected data sets, a user could retrieve data only from within the context of a database connection. Unfortunately, database connections are extremely expensive resources. Your computer must execute a tremendous number of instructions to create

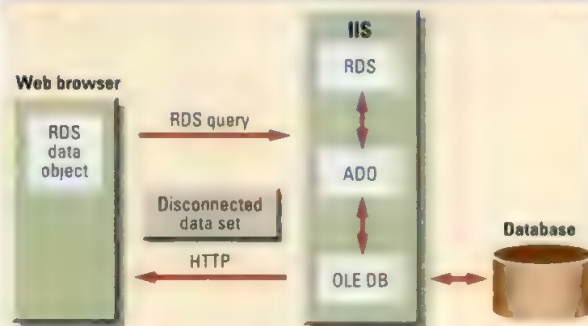
a database connection, maintaining one consumes a significant amount of memory, and a large number of instructions must be executed to tear down the connection when you are finished. In addition, it's likely that your client/server database vendor prices your installation based on the number of simultaneous connections. Given these considerations and the fundamentally connectionless model of the Internet, maintaining database connections for users who may never reconnect makes little sense. Hence the need for a disconnected data set.

How does a disconnected data set work? If we want to make use of updatable data, the database must know how and where to update any changes that the user submits back to the database server. Typically, this "how" and "where" information is maintained by the database connection. In the world of disconnected data sets and RDS, however, that information is now contained within the disconnected data set itself.

The diagram to the left shows the life cycle of a disconnected data set. You can think of a disconnected data set as one that outlives its connection to the database server. You submit a query to RDS, which passes the query along to the database server for execution. RDS takes the results of the query, packages them as a disconnected data set, and transmits the data set back to the client's Web browser over an HTTP connection.

Once the data arrives in the user's browser, it is available for use by code that is running on the client—typically, VBScript code running within the context of a Web browser. You

LIFE CYCLE OF REMOTE DATA SERVICE



known as Remote Data Service (formerly known as Advanced Data Connector or ADC). At the core of RDS is the notion of a *disconnected data set*. In the world before disconnected data sets, a user could retrieve data only from within the context of a database connection. Unfortunately, database connections are extremely expensive resources. Your computer must execute a tremendous number of instructions to create

IIS 4.0: The Transactional Web Server

Version 4.0 of Microsoft Internet Information Server represents a dramatic leap forward in Internet application development, adding a number of significant new features to those of IIS 3.0. Perhaps most important is the integration of Microsoft Transaction Server, which adds support for building applications whose components can be distributed over many computers on a network.

MTS solves many of the problems developers encounter in building distributed applications: concurrency, security, resource pooling, and transaction processing. The IIS 4.0 release of MTS adds automatic transaction support to scripting code executing within ASP files.

Other features include:

- *Internet Mail Server*. IIS can perform mail operations in response to server events. For example, IIS can automatically send a confirmation e-mail to a customer who has completed a particular task on the Web site.
- *News Server*. Version 4.0 adds support for creating local discussion groups using NNTP. You can use any standard news-reader client to participate in these groups.
- *Script Debugger*. This debugging tool makes it possible to debug server-side ASP scripts interactively. Script Debugger ships as a standalone product with IIS 4.0 and will be integrated into a future release of Visual InterDev.

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can choose to manipulate the contents of the distributed data set programmatically, or you can bind the data set to data-aware controls.

If you choose to manipulate the contents of the distributed data set programmatically, you'll be relieved to hear that the programming model of RDS is ADO. If you know how to write applications that take advantage of ADO, then you already know how to write applications that use RDS. You can even sort and filter your distributed data set, taking advantage of client-side processing to generate views of your data for your users.

However, only users of Internet Explorer can access your live data. This is an important decision that you will have to make with respect to your users. If you need to be able to access live data from within a Web browser and compatibility with other Web browsers is important, you may want to consider using the forthcoming Java-based technologies for accessing live data.

ADDING IT UP

When building a dynamic Web site, there are three factors that you will want to consider. The first is the type of site: Do you want to have dynamic data, live data, or both? The second is the scale of the site: Will it be a low-traffic internal site, or a high-traffic external site? The third is the type of browser that will be accessing your site: Can you count on the clients being exclusively Internet Explorer?

By carefully considering each of these factors, you'll be in a much better position to choose which set or sets of technologies are best suited for your Web site. For those of you interested in the technical details regarding implementation of a sample site that uses ASP to generate dynamic Web pages that can be viewed by any Web browser, see the Power Programming column in this issue. In a future article, I'll explore the options that are available to you if you want to manipulate live data.

FURTHER INFORMATION

Two sites provide excellent information on Active Server Pages and Remote Data Access: www.microsoft.com/asp (Microsoft's source for information on ASP) and www.microsoft.com/data (Microsoft's Universal Data Access Web site).

Professional Active Server Pages (Wrox Press, 1997) is a very useful source of information on all aspects of creating active server pages. 

John Lam is the curator of the Web site IUnknown.com. He spends most of his time thinking, writing, or teaching about COM. To contact him, drop by www.IUnknown.com.

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The ABC's of Windows 95 Networks

If you start with the basics, you don't have to be an engineer to set up a network.

By Neil Randall

Just the mention of the word "network" conjures up daunting images in the minds of many people. "Network" implies oversize office buildings filled with computers linked together in an intricate and intimidating maze. Certainly that kind of entity could be maintained only by hard-core engineers and computer scientists, right?

Not necessarily. If you keep in mind that a computer network is nothing more than two or more computers wired together to allow easy exchange of information, the intimidation dissipates. Establishing a small network is a reasonably simple task, one that requires at its most basic only two computers and a cable to join them. In this column we'll discuss how to establish small networks using two or three machines running Windows 95.

There are two types of PC-based networks: *client/server* and *peer-to-peer*. The differences, as the names suggest, lie in the relationships among the network's machines.

On a client/server network, the machines that act as central resources and make programs and data available to other machines on the network are called *servers*, and the connected workstations are called *clients*. Clients are sufficiently powerful to perform many computing tasks, but specialized or secured information is better delivered through a centralized server. A client requests information from a server, and if the client is authorized to receive that information, the server fulfills the request. A client/server network requires a *network operating system* (NOS) to provide services such as file sharing, e-mail, and telecommunications. Microsoft Windows NT Server and Novell's NetWare are two of several NOSs available for Intel-based machines.

In a peer-to-peer network, by contrast, all machines are considered equal in the sense that no central computer is operating as a server. Workstations connect directly with

other workstations to exchange information. Each machine can be accessed by other machines with varying levels of security. Windows 95 offers built-in peer-to-peer networking features, so if you already have systems running Windows 95 it makes sense to construct a peer-to-peer network first, moving to a client/server solution only if the need arises. The reason for this is that a client/server network with Windows 95 requires the purchase of NOS software and a considerable amount of setup and administration time. Typically, client/server networks are necessary when so many computers are involved that keeping track of file and resource sharing becomes impossible, at which point convenience and security become concerns.

THREE WAYS TO CONNECT

Windows 95 offers three hardware methods of connecting computers into a network: modified serial or parallel cable, modem, and network interface card (NIC). The fastest

a CD-ROM or removable disk drive between two computers, Windows 95 provides Direct Cable Connection (DCC) and Dial-Up Networking. The disadvantage of both these methods is that you can connect only two machines at a time. The advantages are low cost and versatility. One modified cable can be used to connect any number of pairs of computers on which you install Windows 95, and two external modems will do the same thing. NICs, on the other hand, are internal peripherals and thus harder to move from machine to machine.

Here, we'll cover DCC and NIC networks. Both are possible with any installation of Windows 95. Establishing a small Dial-Up Networking network requires Dial-Up Networking Server, which comes with Microsoft Plus.

DIRECT CABLE CONNECTION

As the name suggests, with Direct Cable Connection you connect two computers using a null-modem cable running directly from one machine to the other. The cable differs from a standard serial cable in that the pin assignments on one end are different from those on the other (standard serial cable pins have the same assignments on both ends). More significant, the Transmit Data wire and Receive Data wire are reversed to allow data to be transmitted from one computer and received by the other.

You can also achieve a faster connection by running a modified parallel cable between the parallel (printer) ports of the two machines. The cable's pin assignments are modified on one end to allow direct data transfer. If each computer has a bidirectional parallel port (standard on recent PCs), you can reach up to 120K per second, approximately eight times the speed of a connection through two 16550 UART serial ports. With two Enhanced Parallel Ports (EPPs) or Extended Capabilities Ports (ECPs), speeds can reach a full megabyte per second or better. In all cases, you must have the same type of port on both computers.

Once you've connected the cable between the serial or parallel ports of the two machines, you must install Windows 95's DCC software. Open the Add/Remove Programs applet in Control Panel, click on the *Windows Setup* tab, select *Communications*, click *Details*, and check *Direct Cable Connection* (this will also install Dial-Up Networking,

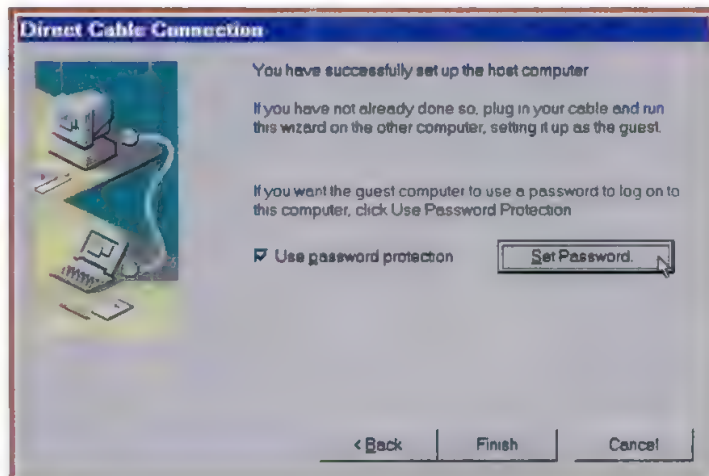


FIGURE 1: Windows 95's Direct Cable Connection lets you set a password that the guest computer must use when connecting to the host.

solution allowing the greatest network sophistication is using NICs, of which Ethernet cards are the most common. If you want a network of three or more devices simultaneously connected to one another, NICs are your only choice. But if all you're after is a simple network to share files, a printer, and perhaps

if it isn't already installed). You'll be asked for your Windows 95 CD.

When the installation is complete, including the mandatory restart, choose *Start | Programs | Accessories | Direct Cable Connection*. This starts the DCC wizard, which begins by asking if you want to establish the current machine as host or guest. This relationship is the basis of the DCC network: The guest machine has access to shared resources on the host machine, but the host has no access to the guest. It's a one-way network. The wizard will then ask you to select a port (parallel or serial) to use as the DCC connection and instruct you to plug in the cable. Figure 1 shows the final dialog of a host setup.

CONNECTING THROUGH NICs

NICs have dropped in price over the past few months, and many are cheaper than modems. They also offer much faster data transfer than modems or null-modem cables. Because of these reasons, plus the fact that NIC-based connections provide richer networking features than either DCC or Dial-Up Networking, the best Windows 95 networking solution—even for networks of two or three computers—is using NICs.

A NIC-based network lets you connect more than two machines. You can also establish true peer-to-peer networks, with each machine having access to resources on all the others. On a NIC-based network, all machines can share a printer from one computer, a removable disk drive from another, files and folders on all, and so on. It is by far the most versatile solution.

The most common type of NIC is designed for the Ethernet architecture and is thus called an Ethernet adapter (or card). We'll describe how to set up a small Ethernet-based network. Each computer must have its own Ethernet card. Many different brands are on the market—SMC and 3COM are two—and they can be mixed and matched across the network.

The first step is to install a network card in each machine, then power up Windows 95. Usually—and especially with recently released cards—Windows 95 recognizes the hardware and automatically installs the drivers for you. If it doesn't, you can install the adapter using the Network applet in Control Panel. Click *Add*, then choose *Adapter*, and select your adapter from the list or install the drivers from the disk you received with the card.

Where most first-try Ethernet installations fail isn't in the choice of adapter card, but rather in the choice of cable or in the omission of a *hub*. The most common connector type is RJ-45, which looks like a slightly enlarged telephone jack. The cable attached to it is referred

to as a twisted-pair cable. It would seem that all you need to do is buy a twisted-pair cable and plug one RJ-45 end into the Ethernet card of the first computer and the other end into the Ethernet card of the second. Right away, however, you run into the two most common problems. First, if you have three or more computers, you can't just daisy-chain twisted-pair cables from machine to machine. Second, if you have a two-computer network, the standard twisted-pair cable won't work.

Let's look at the two-station network first. Recall that Direct Cable Connection required not a standard serial or parallel cable to connect two computers, but rather a modified cable. The same holds true for two computers connected through Ethernet cards. You need a modified twisted-pair cable, called a cross-wire (or X-wire) twisted-pair cable, to make the two-station network function. Plug one end into the first Ethernet card and the other into the second and you're ready to establish your network.

For more than two computers, you need standard (not cross-wire) twisted-pair cable, plus a network hub. Hubs are hardware devices that contain multiple RJ-45 ports, and they range in price from about \$50 to several hundred dollars. You plug a twisted-pair cable into the Ethernet card of each computer, then into the hub. That lets multiple computers on a network talk to each other; the maximum number of computers depends on the size of the hub. You can buy hubs with as few as four RJ-45 ports, and as your needs grow, you can

you have, say, two desktop machines and one notebook. You can buy an Ethernet PCMCIA card for the notebook and plug it into the hub whenever you need to exchange or update files or resources. If your notebook doesn't have a CD-ROM drive, for example, this will allow it to use the CD-ROM drive on a desktop machine, and the speed will be quite acceptable.

SETTING UP A NETWORK PROTOCOL AND CLIENT

No matter what kind of network you establish, you need a network protocol and a network client. Protocols allow computers to communicate with one another, and all computers on the network must share the same one. It's entirely possible (and very common) to have multiple protocols on one computer, but all the computers must have at least one in common in order to talk to each other. Network clients determine how your machine will make use of the protocol to initiate and maintain communications.

To set your client and protocol, open the Network applet in Control Panel. If you've installed a NIC or modem with Dial-Up Networking, Windows 95 installs Client for Microsoft Networks by default, and that's all you need for your small network. If not, click *Add* from the Network dialog, then select *Client* in the Select Network Component Type dialog and click *Add*. In the resulting dialog (called Select Network Client), choose *Microsoft* in the *Manufacturer* pane and *Client for Microsoft Networks* in the *Network Clients* pane.

Next you'll need a protocol. NetBEUI (NetBIOS Extended User Interface) is standard with all Microsoft-based networking. Again, click *Add* from the Network dialog, but this time click *Protocol* from the resulting dialog and *Microsoft/NetBEUI* from the protocols dialog. If you think you'll ever want to connect to the Internet, this is a good time to install TCP/IP (the protocol all computers connected to the Internet must run) as well.

In order for your network to run, you need to *bind* the client, protocol, and adapter

together. Windows 95 establishes these bindings for you automatically when you install the three components, so you rarely if ever need to do so yourself. If you do need to bind manually, go to the Properties dialog for the NetBEUI protocol, and click the *Bindings* tab to ensure that a binding is in place for the adapters and

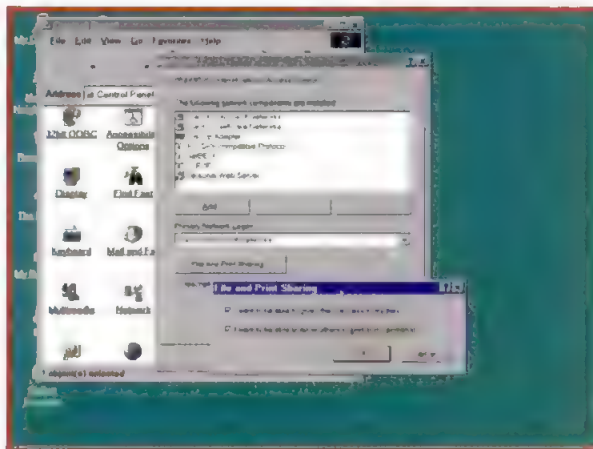


FIGURE 2: For the fullest possible range of networking solutions, activate both file and printer sharing.

replace the hub with one that will support more computers.

You can also use the hub for your two-station network. Instead of buying one cross-wire twisted-pair cable, you'll need to buy two standard cables and a small hub. This is a useful solution if you plan on expanding or if

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clients. The primary function of this dialog is to remove selected bindings for the sake of network performance, but that step won't be necessary for your small network.

SETTING UP FILE AND PRINT SHARING

The primary function of a peer-to-peer network is to share files and printers. No matter what hardware method you use, you'll need to set up File and Print Sharing through Windows 95's Network applet in Control Panel (see Figure 2). Open the applet, click the *File and Print Sharing* button, and then tell Windows that you want to allow other computers to share your files, your printer, or both by checking the appropriate box(es). Then restart Windows.

The next step is establishing which resources you wish to share. To share a file, a folder, or an entire drive, including a CD-ROM or removable disk drive, locate the resource in My Computer or Explorer. Right-click on its icon, then select *Sharing* from the menu. To share a printer, open the Printers folder through My Computer, Control Panel, or

modify it in any way, including deleting or renaming. The file can be downloaded to another machine, however, and this is the primary use for read-only access. Full access is also obvious: the resource is fair game to anyone who accesses it. The other option is *Depends on Password*. Here you can specify that one password allows read-only access to the resource and a different password gives full access. Using this option, you can give the read-only password to certain users and the full-access password to others. You can also password-protect a shared printer, but all printer shares offer full access only.

ACCESSING SHARED RESOURCES

The purpose of establishing a network is to share resources. The exact method of sharing depends on the type of network you've set up. With DCC, you must set the resources you wish to share on one of the computers and then designate that computer as the host. Next, plug the modified serial or parallel cable into both computers, then start DCC on the second computer and designate it as the guest.

Windows 95 makes the connection, at which point you can open Network Neighborhood or the automatically started DCC window and access the shared files and folders. If you wish to print a document from the guest computer, for example, and you've established a shared printer on the host, you can choose the *Print* command from within the application and choose the shared printer from there, or you can drag the document to the shared printer's icon.

Sharing resources across a NIC-based network is similar but more versatile. Each computer is given its own name when you install the networking software, and Network Neighborhood lists the names of the computers on the network and the shared resources on each one. Again, you can share resources through Network Neighborhood or through the DCC window. You can directly save files to drives on a different machine through the Save dialog, for example, or you can copy or move files through Explorer. As you get more ambitious, you can designate an increasing number of resources as shared. But remember that the more shares you establish, the more difficult the network becomes to administer. **PC**

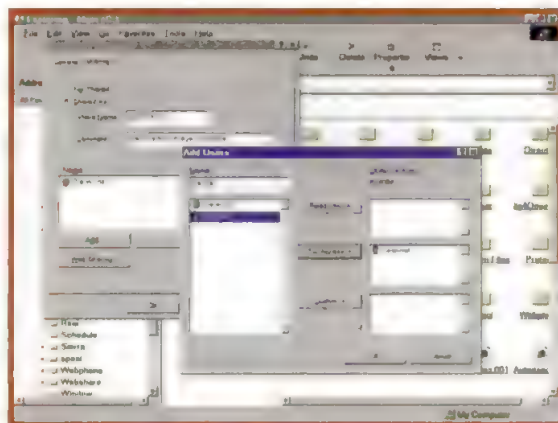


FIGURE 3: You can allow other users to access a file, folder, or entire drive from Windows 95's Sharing dialog box.

Start | Settings, right-click on the appropriate printer icon, and again select *Sharing* from the menu. The Sharing dialog is identical in either case (see Figure 3). (The Sharing dialog in Internet Explorer 4 and Windows 98 differs from the one in Windows 95.)

In this dialog, the resource is *Not Shared* by default. Click the *Shared As* radio button and give the resource a name (use something easily remembered, such as "CD-ROM" or "Data Drive"). In the *Comment* box, type explanatory text that will appear when users connect to the machine and select the resource from Explorer. In the *Access Type* area of the dialog, you must determine the degree of access to the resource you wish to allow. Read-only means exactly what it says: The accessing computer can view the file but can't

Neil Randall is the author of *The Soul of the Internet (ITCP)* and Special Edition Using Microsoft FrontPage 98 (*Que*).

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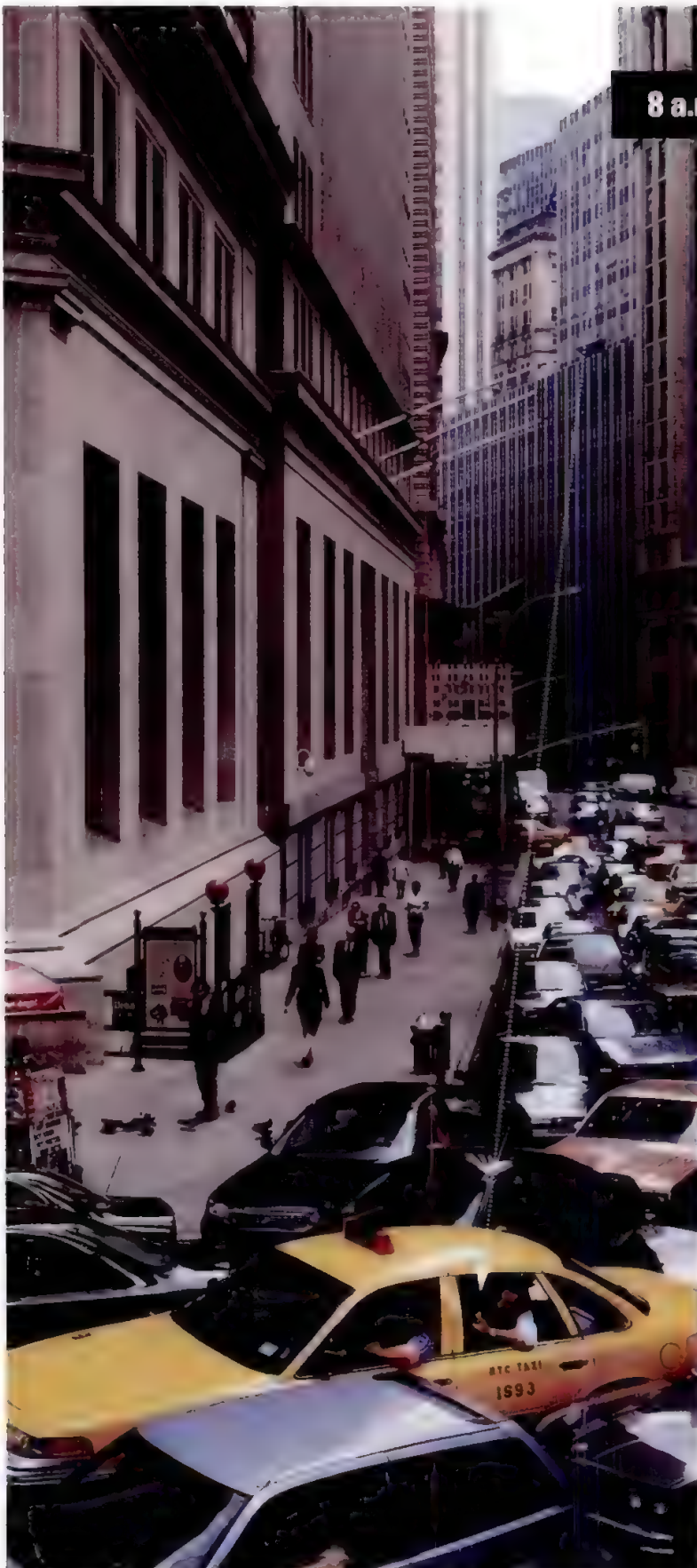
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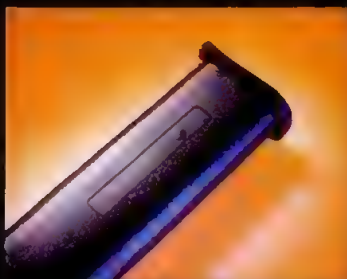
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Visual InterDev and ASP

Building a dynamic Web site with Visual InterDev and Active Server Pages.

By John Lam

Buoyed by this issue's PC Tech feature and your own boundless enthusiasm, you're just dying to build your first dynamic Web site, right? But before you go running to your keyboard, wait just one minute and consider this: There are two ways to build your new dynamic Web site: the easy way and the hard way.

An Active Server Page (.ASP) file is a text file that's interpreted at run time by the Active Scripting engine of Microsoft Internet Information Server (IIS). How you choose to create that text file is up to you. If you're a die-hard fan of the ever-versatile development tool Notepad, you'll be disappointed by the simplicity of the techniques presented by this article. But if you're looking for an easy, quick start on building your dynamic Web site, reach for Microsoft Visual InterDev (\$499 list; competitive upgrade, \$249) instead.

You can think of Visual InterDev as an integrated development environment (IDE) for creating dynamic Web sites. Like most other IDEs, Visual InterDev combines a number of tools into a single package to simplify your development chores. There is support for project management, syntax highlighting of different types of Web files (such as ASP or HTML), automatic synchronization of local files with Web server files, and integrated database access. Since Visual InterDev shares the customizable Developer Studio environment with Visual C++ and Visual J++, you can streamline your development process and leverage your knowledge of the Developer Studio IDE.

THE IUNKNOWN.COM WEB SITE

The focus of this article is the construction of a dynamic Web site using Visual InterDev and IIS 3.0. You can visit the fully functional version of this type of Web site on the Internet by pointing your browser to www.iunknown.com, a fairly typical information-publishing Web site with buttons for Community, Search, and Stories; a What's New section; and links to other sites. This site is a fairly simple example that we can discuss within the scope of one article, yet it contains enough different techniques to show you how to get started on your first dynamic Web site.

The site's layout—a main file and several

linked files—is shown in Figure 1. The file `Default.asp` generates the welcome page, which consists of a welcome message and a What's New list. Surrounding this file are several additional .ASP files that show a list of stories (`Stories.asp`), a list of links (`Links.asp`), a single story (`Story.asp`), and an author biography (`Author.asp`).

Navigation among these pages is fairly straightforward. A single navigation bar at the top of each page provides one-click access to any of the other pages (Figure 2). At the bottom of each page, a single link takes you back to the top. Within the body of each page is a series of additional links that pass parameters to the other .ASP files and cause them to generate a custom Web page based on those parameters.

With that overview out of the way, let's start constructing `IUnknown.com`.

FIRST STEPS

Your first step is to run Visual InterDev's Web Project Wizard (Figure 3). The wizard collects some basic information about the

After the wizard is finished, you'll have a new Developer Studio Workspace file from which to create your new Web site. As you can see in Figure 4, the wizard has also populated the project with the file `Global.asa` and a folder called `Images`. `Global.asa` is for storing global settings used throughout the ASP application, and `Images` contains the various graphical images that you will display on your Web pages.

Next, we'll create the primary entry point into `IUnknown.com`: the `Default.asp` page. You can use Visual InterDev's Active Server Page wizard to create an empty `Default.asp` file in your project. In my IIS installation, this happens to be the default page that users see when they browse a virtual directory. If you want to use a different file, you can change the default-page setting by running the Internet Service Manager, which is included with IIS.

One of the great features of a Visual InterDev project is the automatic synchronization of local files and the master copies of those files on the Web server. After you have created `Default.asp` using the Active Server Page wizard, Visual InterDev automatically creates a copy of that file on your Web server. This eliminates a particularly error-prone step from your Web development process.

As we saw in Figure 2, the pages in `IUnknown.com` have a consistent look and feel. Ideally, a site's look and feel should be easily administered by editing no more than one or two files. For `IUnknown.com`, I've created a file called `Header.htm`, which contains some HTML code for the top of every Web page. There's also a corresponding file, `Footer.htm`, which contains some HTML

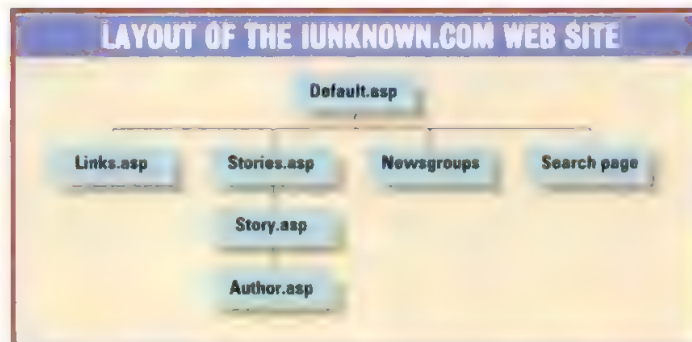


FIGURE 1: The overall layout of the `IUnknown.com` Web site. A central Web page called `Default.asp` leads to each of the other Web pages, which are dynamically generated. `Default.asp` also contains links to `newsgroups` on the Web site and a search page.

name of the new site you're creating and the address of the Web server on which the site will be created (in our case www.iunknown.com). Note that I did not check the check box labeled *Enable full text searching for pages in this Web*. Normally, that option instructs IIS to use Index Server to index the contents of our Web pages. But since we are building a dynamic Web site, where all pages are created on the fly from database records, the feature is of little use to us.

code for the bottom of every Web page.

So how do you include these files in each of the Web pages dynamically generated by our .ASP files? By far the quickest way is to use some of the new design-time ActiveX controls that ship with Visual InterDev.

DESIGN-TIME ACTIVEX CONTROLS

A design-time ActiveX control can generate and execute code. It presents you with a user interface that lets you define a number of

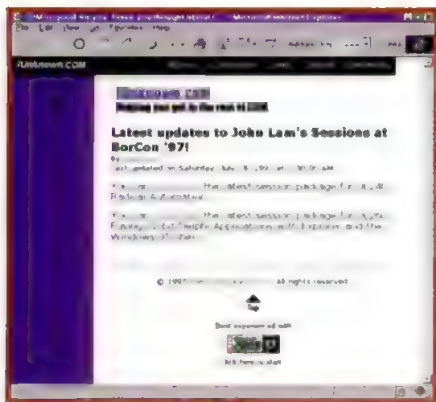


FIGURE 2: The navigation bar at the top of each page gives you access to each top-level page within the Web site. At the bottom of each page is a navigation link to the top of the site.

parameters at design time, and it uses those parameters to generate scripting code in your .ASP file. At runtime, the ActiveX control can also interpret some of the parameters it has added to your .ASP file and perform some actions.

A design-time ActiveX control is an extremely versatile code generator. The lan-

clude control is used to include boilerplate text from a file. The Data Command control generates the code required to create an ActiveX Data Objects (ADO) recordset object.

I used the Include control to generate some standard code that I inserted into every .ASP file in the Web site. I inserted two Include controls into each .ASP file: one that included Header.htm, and one that included Footer .htm. The code generated by the Include control looks like this:

```
<!--METADATA TYPE="DesignerControl"
startspan
<OBJECT ID="Include1" WIDTH=150
HEIGHT=23
CLASSID="CLSID:F602E725-A281-11CF-
A5B7-0080C73AAC7E">
<PARAM NAME="_Version" VALUE="65536">
<PARAM NAME="_ExtentX" VALUE="3175">
<PARAM NAME="_ExtentY" VALUE="508">
<PARAM NAME="_StockProps" VALUE="0">
<PARAM NAME="Source"
VALUE="header.htm">
</OBJECT> -->
```

As you can see, the important property of this ActiveX control is the Source named property, which has a value of "header.htm," the name of the HTML file that we want to include at runtime in the dynamically generated HTML page.

The Data Command control allows you to construct SQL queries to retrieve data from your database. We'll take a look at this control next, when we examine how to build a database connection from an Active Server Page.

DATABASE CONNECTION

Before we can begin manipulating data in a database, we have to establish a connection to it. Visual InterDev's simple user interface allows you to establish a new database connection with a server database on a network.

For IUnknown.com, we'll use Microsoft SQL Server 6.5 as the database. In order to add this connection to our Visual InterDev project, all we have to do is right-click on the project and select *Add Data Connection* from the context menu. A simple dialog box (Figure 5) prompts us to select or create a new data source name (DSN). Visual InterDev then takes the information from the predefined database connection and adds

the following statements to Global.asa:

```
'-Project Data Connection
Session("IUnknown_ConnectionString") =
"DSN=SQL
Server;UID=sa;PWD=;APP=Microsoft (R)
Developer
Studio;WSID=GRIFFEY;DATABASE=IUnknown"
Session("IUnknown_ConnectionTimeout")
= 15
Session("IUnknown_CommandTimeout")
= 30
Session("IUnknown_RuntimeUserName")
= "sa"
Session("IUnknown_RuntimePassword")
= ""
'==Visual InterDev Generated -
'DataConnection endspan==
```

Note that Visual InterDev creates a set of named properties inside the Session object that you can reference from within your ASP pages. Later we'll see how the Data Command control uses this information to build connections to your database.

An aside: Most client/server databases, such as SQL Server 6.5, are sold on the basis of the number of concurrent connections that they allow. But there is no way to enforce licensing restrictions in today's world of Internet data access, since there are no persistent connections to your database server. To compensate for the potentially large number of hits on your database server, Microsoft charges a flat fee of \$2,995 to connect your SQL Server 6.5 database to the Internet. For smaller Web sites, which do not require the full power of this type of client/server database, you can run Microsoft Access or something similar at considerably less expense.

We use three tables (Stories, Authors, and Links) to store the data required by IUnknown.com. The structure of these tables is shown in Figure 6.

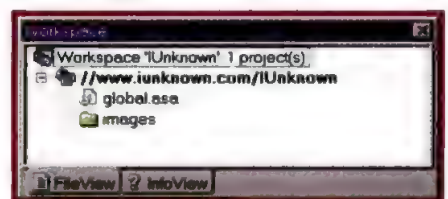


FIGURE 4: The default files generated by the Web Project viewer for your new Web site.

The Stories table is where all stories are kept. A story consists of an abstract and a body. Only a single author can write a story (a limitation of this Web site that serves to keep things simple), and we enforce a one-to-many

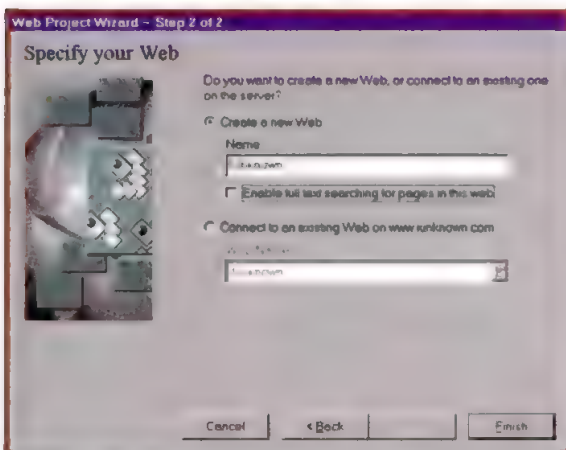


FIGURE 3: You can use the Web Project Wizard in Visual InterDev to create your new Web site quickly.

guage setting of your .ASP file determines whether the control produces VBScript or Jscript output. More important, the code the control generates can be regenerated. If you change your mind about certain property settings in the ActiveX control, you can change those settings and ask the control to generate new code. That's a significant improvement over other wizard-based code generators, such as Visual C++'s AppWizard.

Four design-time ActiveX controls are included with Visual InterDev. We'll focus on the ones you will use most often, the Include control and the Data Command control. The In-

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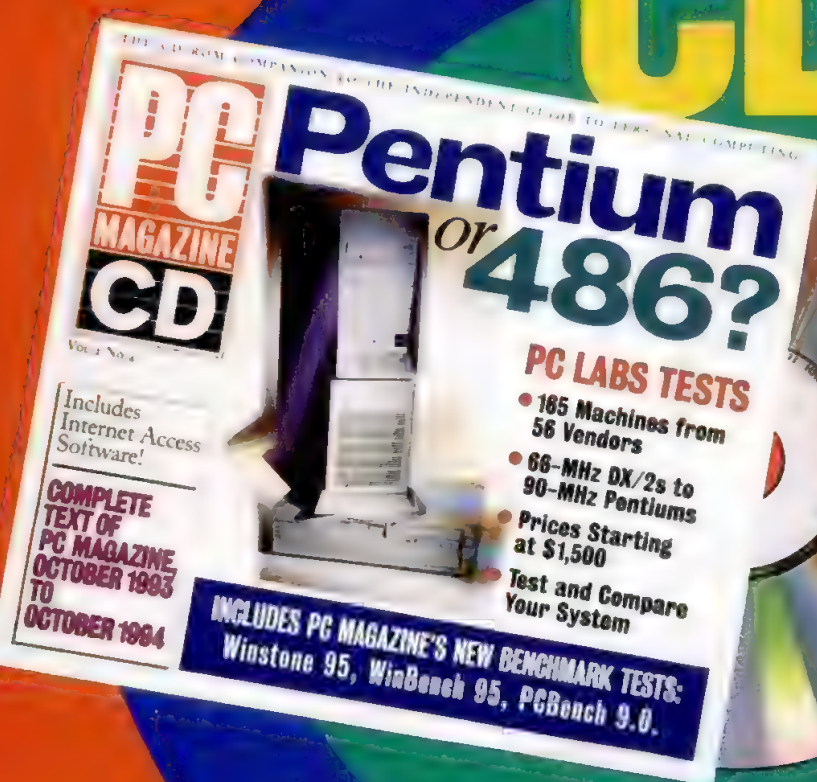
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CIRCLE 171 ON READER SERVICE CARD

relationship between authors and stories.

Links contains a number of links that can be grouped into categories. We'll use a SQL statement to filter for the categories that we want to add in the Web site.

Once you've defined the database connection, you'll want to create some additional ADO components to query and manipulate the data in the database. By using the Data Command control, you can greatly simplify the amount of work needed to create these components.

ACCESSING THE DATA

After you insert a new Data Command control into your project, you'll see its ActiveX control Properties dialog. You can use this property sheet to select the appropriate data connection; in our case, it's the IUnknown database connection we established in Global.asa. You will also use this property sheet to construct your SQL statement. You can type the SQL text in yourself, or you can use Visual InterDev's graphical SQL query builder. We entered the following SQL statement for our query:

```
"SELECT Stories.Active, Stories.Type,
Stories.Title, Stories.Abstract FROM
Stories WHERE Stories.Type =
'Welcome' AND Stories.Active = 1"
```

The Data Command control generated the following code in our .ASP file:

```
<%
Set DataConnection = Server.Create
Object("ADODB.Connection")
DataConnection.ConnectionTimeout =
Session("IUnknown_ConnectionTimeout")
DataConnection.CommandTimeout =
Session("IUnknown_CommandTimeout")
DataConnection.Open Session
("IUnknown_ConnectionString"),
Session("IUnknown_RuntimeUserName"),
Session("IUnknown_RuntimePassword")
Set cmdTemp1 = Server.CreateObject
("ADODB.Command")
Set WelcomeRecordSet = Server
.CreateObject("ADODB.Recordset")
cmdTemp1.CommandText = "SELECT
Stories.Active, Stories.Type,
Stories.Title, Stories.Abstract FROM
Stories WHERE Stories.Type =
'Welcome' AND Stories.Active = 1"
cmdTemp1.CommandType = 1
Set cmdTemp1.ActiveConnection =
DataConnection
WelcomeRecordSet.Open cmdTemp1, , 3, 1
%>
```

In this case, I am interested only in extracting the currently active Welcome message from the Stories table. The code that serves to display this message to the screen is shown below:

```
<font size = 3><b><%= Welcome
RecordSet( "Title" )%></b></font><br>
<font size = 2><%= WelcomeRecordSet
( "Abstract" )%></font><br>
```

The next section in the Default.asp page is the What's New section. In a process similar to the one that extracts the Welcome message from the Stories table, I use the following SQL query to extract the latest stories from the Stories table:

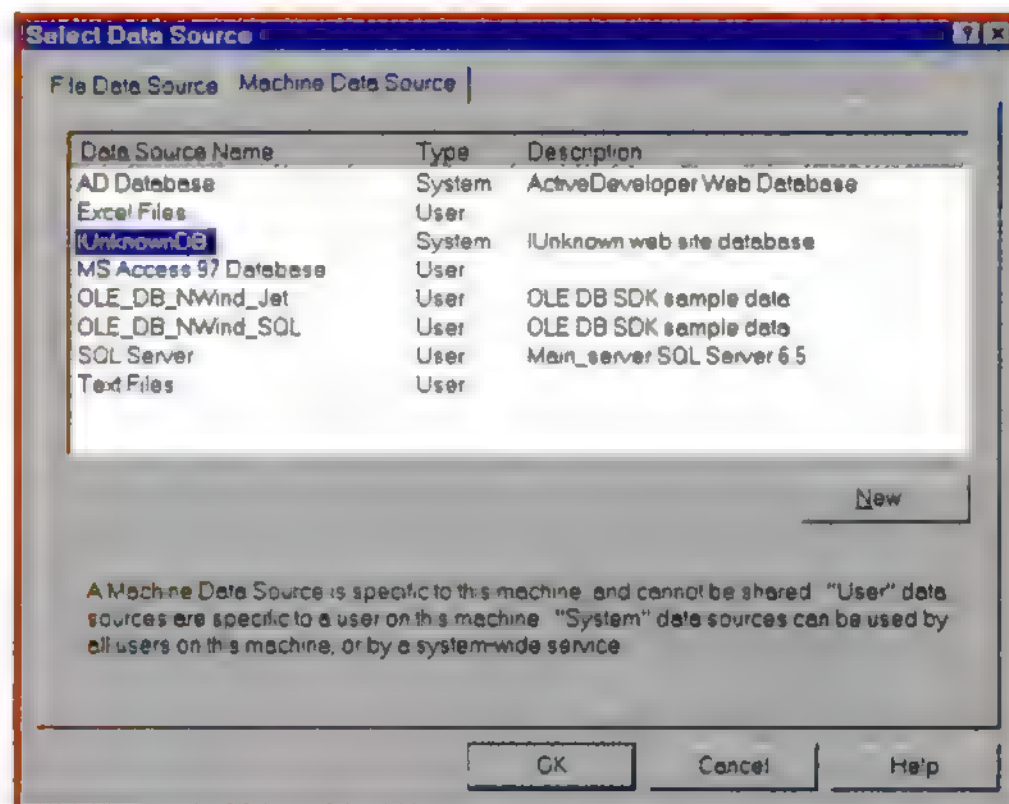


FIGURE 5: This dialog lets you add a new data connection to your Visual InterDev project.

```
SELECT Stories.""Date"",
Stories.Title, Stories.Abstract,
Authors.First_Name, Authors.Last_Name,
Stories.StoryID FROM Authors INNER
JOIN Stories ON Authors.AuthorID =
Stories.AuthorID WHERE Stories.Type =
'Article' AND Stories.Active = 2 ORDER
BY Stories.""Date"" DESC
```

In this case, several records will be displayed in the What's New section. Thus, we will be using the following while loop to generate the results of the query:

```
<%
Do While Not ArticleRecordSet.EOF
%>
<a href="story.asp?StoryID=<%=
ArticleRecordSet( "StoryID" )%>"><br>
<font size = 3><b><%=Response.Write
(ArticleRecordSet( "Title" ))%></b>
</font></a><br>
```

```
<font size = 1><i>Updated on <%=
FormatDateTime( ArticleRecordSet
( "Date" ), vbLongDate)
%></i></font><br>
<font size = 2><%= ArticleRecordSet
( "Abstract" )%></font><br><br>
<%
ArticleRecordSet.MoveNext
Loop
%>
```

During each pass through the loop, the code gets executed until the ArticleRecordSet.EOF is True.

SQL SERVER STORED PROCEDURES

In the Links.asp page, I show a slightly different way to access the data in your database. You can take advantage of SQL stored procedures to optimize the performance of your queries. Since SQL stored procedures are executed in compiled form, you can get significantly better performance than you can by issuing SQL statements that must be parsed by the server before they are executed. The code that uses a SQL stored procedure named sp_GroupLinks is shown in Figure 7.

The shaded code is used to create the list of parameters passed to the stored procedure. The Category parameter is simply a name used in the WHERE clause of the SQL SELECT statement in the stored procedure. The stored-procedure code is shown below:

```
Create Procedure sp_GroupLinks
@Category char(30) As
SELECT Title, Description, URL
FROM Links
WHERE Category1 = @Category AND
Category2 = 'Site'
ORDER BY Title
```

Because of the limited amount of space in this column, I can't walk you through the rest of the code. The other pages are similar; I encourage you to drop by the site and download the source code.

The easiest way to edit your database's tables is to attach them to a Microsoft Access

WALL ST

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4 MORE TRADERS MEANS MORE TRADES, which means more money. (And let's be completely frank, shall we, what financial person doesn't like news like that?) In fact, one could even argue that migrating from big, bulky CRTs to slim flat panel monitors like the MultiSync LCD2000 could actually put a positive spin on the term 'downsizing.'



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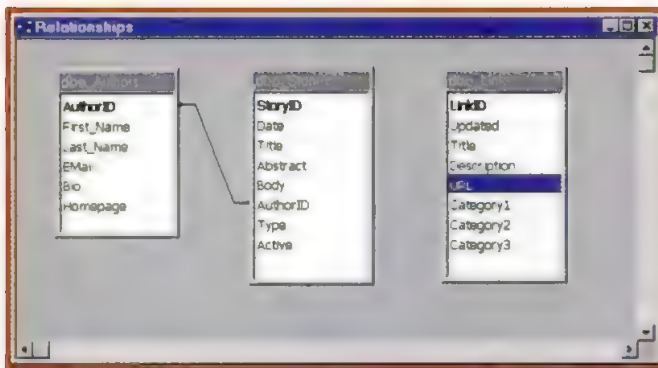


FIGURE 6: The database tables that are used by the IUnknown.com Web site.

database. You can build some handy forms to manipulate the data.

I created the files for IUnknown.com with Microsoft Word and saved them as HTML files. I brought up the HTML files in Notepad and cut and pasted the contents into the appropriate field of an Access form. It would be great to automate that process so that you could save files directly from Word into your data tables. I'll leave that as an exercise for some enterprising Office 97 VBA developer.

WRITING SOME ASP CODE

At some point, we should be writing ASP code beyond what we are employing to display the results of our ADO recordset objects. In this section, we will take a look at code that displays two things you'll find on almost all Web sites: the current date and a count of the number of users who have visited the Web site.

Displaying the date is simple, as you can see by the following line of HTML:

```
<font size = 2><%= FormatDateTime  
( Date, vbLongDate )%></font><br><br>
```

Accessing Date retrieves today's date from the VBScript engine. The function FormatDateTime formats the date in the vbLongDate format.

A common use of CGI scripts in the past was to implement some form of page counter. Most of these page-counter applications incremented the counter each time a user hit the main page of a Web site. That, unfortunately, is not an accurate way of obtaining such an assessment.

In this issue's PC Tech feature, "Database Connectivity and the Internet," we defined a Session object. We'll take advantage of the fact that IIS automatically tracks each user within the context of a Session object to obtain a far more accurate count of the number of users who have visited our Web site.

IIS fires events in your ASP application whenever a new Session object is created. Typically you handle these events by creating a named event handler in your Global.asa file. To implement a page counter, I increment the counter NumVisitors, which is stored as a property of the Application object, as follows:

```
Sub Session_OnStart  
    Application.Lock  
    Application  
    ("NumVisitors") =  
    Application("Num  
    Visitors") + 1  
    Application.Unlock  
    ...  
End Sub
```

It is necessary to lock the Application object since several Session objects may be attempting to increment NumVisitors at the same time. Finally, to display the current value of NumVisitors, we use the following line of HTML:

```
You are visitor number  
<%=Application("NumVisitors")%>
```

```
<%  
Set ActiveDeveloper = Server.CreateObject("ADODB.Connection")  
ActiveDeveloper.ConnectionTimeout = Session("IUnknown_ConnectionTimeout")  
ActiveDeveloper.CommandTimeout = Session("IUnknown_CommandTimeout")  
ActiveDeveloper.Open Session("IUnknown_ConnectionString"),  
Session("IUnknown_RuntimeUserName"),  
Session("IUnknown_RuntimePassword")  
Set cmdTemp = Server.CreateObject("ADODB.Command")  
Set LinkRecordSet = Server.CreateObject("ADODB.Recordset")  
cmdTemp.CommandText = "dbo.sp_GroupLinks"  
cmdTemp.CommandType = 4  
Set cmdTemp.ActiveConnection = ActiveDeveloper  
Set tmpParam = cmdTemp.CreateParameter("Return Value", 3, 4, 4)  
cmdTemp.Parameters.Append tmpParam  
Set tmpParam = cmdTemp.CreateParameter("@Category", 129, 1, 30,  
CategoriesControl(  
    "Category1" ))  
cmdTemp.Parameters.Append tmpParam  
LinkRecordSet.Open cmdTemp, , 1, 1  
%>
```

FIGURE 7: The shaded code creates the list of parameters passed to the stored procedure sp_GroupLinks.

DEBUGGING YOUR APPLICATION

What happens when things go wrong? Debugging your ASP VBScript code is currently limited to using the equivalent of print statements.

At the time of this writing, Visual InterDev does not support interactive debugging of ASP applications. But IIS 4.0 will add additional Active Script Debugging functionality to the Web server, and the next release of Visual InterDev will integrate debugging support into the IDE. This means that you will be able to set watches and breakpoints and single-step through your ASP code.

This article has shown you how to use Visual InterDev to create a basic dynamic Web site. Feel free to use any of the .ASP files from www.iunknown.com in your own projects. You can download the source code from the PC Magazine Web site at www.pcmag.com. See the sidebar "Getting the Files" in this issue's Utilities column for downloading instructions.

FURTHER READING

Professional Active Server Pages, by Alex Homer et al. (Wrox Press, 1997), is a detailed look at Active Server Page technology circa IIS 3.0. It includes a good set of case studies. **PC**

John Lam is the curator of the IUnknown.com Web site. He spends most of his time thinking, writing, or teaching about COM. To contact him, drop by www.iunknown.com.



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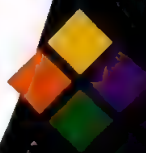
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Put the Squeeze on Compound Files

Unfrag eliminates dead space in compound files and frees disk space in the process.

By Jeff Prosise

If you're a Windows 95 or NT user, you may be losing precious disk space without even knowing it. Most hard disks today contain compound files created by Microsoft Word, Microsoft Excel, and other applications that support Object Linking and Embedding (OLE). Compound files, when fragmented internally, can waste a lot of disk space.

Today, about 5 to 10 percent of the files on a typical hard disk are compound files. Informal testing by *PC Magazine* shows that the average Microsoft Office user loses 1MB to 20MB of hard disk space because of compound file fragmentation. The problem is likely to grow worse as more and more applications become OLE-enabled. It's even possible that in a future version of Windows, all files will be compound files. And if that happens, don't be surprised if your 2GB hard disk sacrifices 100MB or more of usable storage space to the OLE monster.

So what can you do about compound files? Plenty. This issue's free utility, which I've named Unfrag to distinguish it from conventional hard disk defraggers, hunts down compound files and "unfragments" them for you. Running it on your hard disk could restore several megabytes of free disk space. Unfrag does not destroy data; your compound files will contain the same information as before. But now that information will require less room.

Unfrag works with Windows 95 and Windows NT 4.0 or higher. You can get your copy from PC Magazine Online or by mail (see the sidebar "Getting the Files" for details). The source code, which was written in C++ and compiled with Microsoft's Visual C++ 5.0, is available, too. Of course, as

always, you don't have to be a programmer to use this handy utility.

UNDERSTANDING COMPOUND FILES

Part of a spectrum of technologies known as ActiveX, OLE is the software protocol that lets objects created by one application appear in documents created by another. A good example is a Word document that contains an Excel spreadsheet. Most such applications use *compound files* to store documents. Internally, compound files are organized into *storages* and *streams*, in much the same way that a hard

Unfrag

Unfrag hunts down compound files and defragments them. These files are created by Microsoft Word, Microsoft Excel, and other applications that support OLE (Object Linking and Embedding). The files often become fragmented and thus take up an inordinate amount of hard disk space.



disk is organized into folders and files. An OLE/ActiveX technology known as *structured storage* lets programmers create and manipulate compound files.

Compound files make an OLE programmer's life immeasurably easier, because partitioning a file into storages and streams makes it simple for two applications to write to the same file without stepping on each other's toes. But compound files have a dark side,

too. Like hard disks, they are subject to fragmentation. Further, whereas a fragmented disk doesn't rob you of disk space (it does extract a price in performance, but that's another story), fragmented compound files often consume disk space needlessly. A typical Word file contains about 4K of "slop," even if that file contains no embedded objects; theoretically, a compound file containing just a few kilobytes of data could consume a megabyte or more of disk space.

INSTALLING AND USING UNFRAG

To install Unfrag, copy Unfrag.exe to the folder of your choice. There are no auxiliary files or DLLs to copy, and Unfrag writes nothing to your system's registry. You can uninstall the entire program simply by deleting Unfrag.exe.

When executed, Unfrag displays the window pictured in Figure 1. To begin the unfragging process, enter a filename or filename specification (for example, *.doc) in the *Named* box and a pathname identifying a drive or folder in the *Folder* box. If you'd like Unfrag to unfrag compound files in the specified folder and its subfolders, check the *Include subfolders* box. Then click the *Unfrag* button.

To unfrag all the compound files on a drive, simply leave the *Named* field blank (which is equivalent to entering *.*), type the path to the drive's root directory in the *Folder* box (for example, C:\), and check *Include subfolders*. You may click the downward-pointing arrow next to the *Folder* box to see a list of available drives, or you can use the *Browse* button to pick a drive or folder from a dialog box.

As the unfragging runs its course, Unfrag keeps you apprised of its progress with the dialog shown in Figure 2. *Files examined* indicates how many files have been found whose names match the pattern in the *Named* box. *Compound files found* tells you how many of those files are compound files. Each time Unfrag identifies a compound file, it unfragments the file, compares the new file size to the old, and adds the difference to the *Bytes saved* value in the dialog. Note that not all compound files shrink when unfragmented, because some have no dead space. Don't be

FOR PROGRAMMERS ONLY Unfrag was written with Microsoft Visual C++ and MFC (Microsoft Foundation Classes). The source code for Unfrag, available from PC Magazine Online, demonstrates the following programming techniques:

- determining whether a file is compound or not;
- creating new compound files and open existing ones;
- defragmenting compound files using `IStorage::CopyTo`;
- using custom color palettes to paint bitmaps in dialog boxes.

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alarmed if *Bytes saved* doesn't increase every time a compound file is processed.

You can cancel an unfragging operation by clicking the *Cancel* button. When unfragging is complete, the *Cancel* button changes to an *OK* button. The dialog box remains until you click *OK*, so you can review the results of the unfragging process. You may invoke online help for Unfrag by selecting *Help* from the System menu or pressing function key F1.

Unfrag supports a full set of command line options that let it run without user intervention. This feature will come in handy if you wish to use System Agent or a similar utility to schedule the launch of Unfrag and let it run unattended. Unfrag's command line syntax is

```
UNFRAG pathname [/S] [/R] [/C]
```

where *pathname* is the path to the folder containing the files to be unfragmented, */S* tells Unfrag to process files in the specified folder and its subfolders (equivalent to checking the *Include subfolders* box in the Unfrag window), */R* means "Run now" (the equivalent of clicking the *Unfrag* button in Unfrag's main window),

If you'd rather have Unfrag unfrag all the files in drive C:\My Documents folder and its subfolders, use this command instead:

```
UNFRAG "C:\My Documents" /S /R
```

To restrict Unfrag to the My Documents folder (no subfolders), omit the */S* switch:

```
UNFRAG "C:\My Documents" /R
```

If Unfrag is running unattended and you'd like it to shut down when unfragging is complete, simply add a */C* switch:

```
UNFRAG "C:\My Documents" /R /C
```

Be sure to include an */R* switch if you want Unfrag to start processing files immediately. If you omit this switch, unfragging won't begin until you click the *Unfrag* button, although the options you entered on the command line will show up in Unfrag's window (for example, the *Include subfolders* box will be checked if the command line includes an */S* switch).

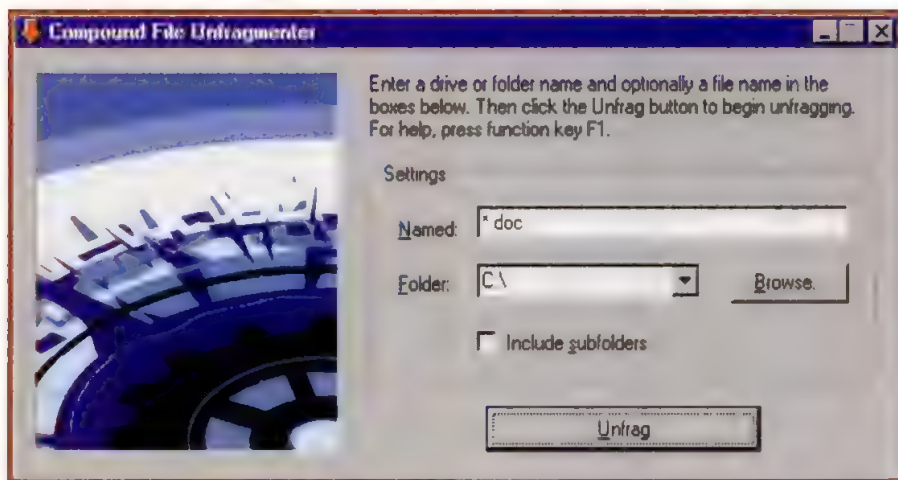


FIGURE 1: Unfrag's user interface resembles that of the Windows Find utility.

and */C* tells Unfrag to close itself once the unfragging is finished. The *pathname* parameter may include a file specification (for example, **.doc*). Be sure to enclose *pathname* in quotation marks if the *pathname* includes spaces. Otherwise, Unfrag will interpret a space embedded in a *pathname* as a separator character marking the end of a command line parameter.

A few examples will help to clarify Unfrag's command line options. Suppose you're using System Agent to launch Unfrag in the wee hours of the morning and you'd like Unfrag to unfrag all the *.doc* files on drive C:. Here's the command to use:

```
UNFRAG C:\*.DOC /S /R
```

UNDER THE HOOD

Unfrag is a dialog-based MFC (Microsoft Foundation Classes) application. Much of its source code is ordinary user interface code for such mundane chores as processing button clicks and retrieving input parameters from the controls in the main window. Unfrag's main window is represented by a *CDialog*-derived class called *CUnfragDlg*. When you click the *Unfrag* button, a click handler in the *CUnfragDlg* class changes to the folder whose *pathname* appears in the *Folder* box and calls *CUnfragDlg::ProcessDirectory*.

ProcessDirectory uses the Win32 *FindFirstFile* and *FindNextFile* functions to enumerate files in the current directory using the

filename specification entered in the *Named* box. When *FindFirstFile* or *FindNextFile* returns the name of a compound file, *ProcessDirectory* calls another *CUnfragDlg* function named *UnfragFile*, which unfragments the file and updates the dialog.

When Unfrag has processed all the files in the current directory, *ProcessDirectory* checks whether the *Include subfolders* box was checked when the operation began. If so, it descends into the next available subfolder (provided a subfolder exists) and calls itself recursively. This recursive approach to processing a folder and its subfolders lets Unfrag process an entire branch of the directory tree with minimal extra code.

How does Unfrag know whether a file is a compound file? The OLE/ActiveX API function *StgIsStorageFile* takes a *filename* as a parameter and returns *S_OK* if the file is a compound file, *S_FALSE* if it is not. If necessary, *MultiByteToWideChar* is used to convert the *filename* from ANSI format to Unicode format before *StgIsStorageFile* is called. This is necessary because OLE/ActiveX API functions expect text strings passed to them to contain "wide" (Unicode) characters.

Once Unfrag determines that a file is a compound file, *CUnfragDlg::UnfragFile* is called to unfragment it. *UnfragFile* begins by calling the API function *StgOpenStorage* to open the compound file for reading:

```
HRESULT hr =
    ::StgOpenStorage (wszInput,
        NULL, STGM_DIRECT | STGM_READ |
        STGM_SHARE_DENY_WRITE, NULL, 0,
        &pIn);

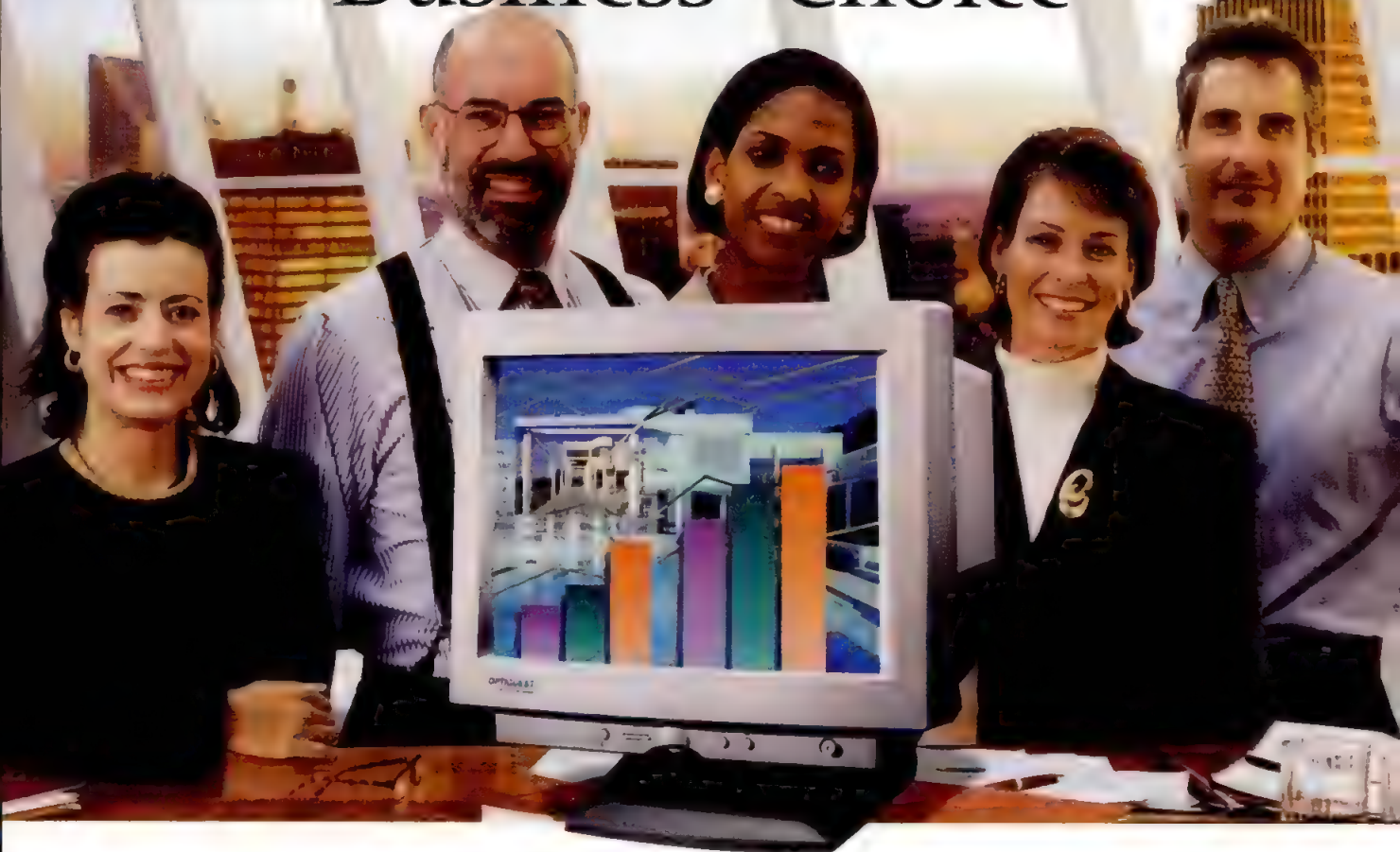
if (FAILED (hr))
    return 0;
```

StgOpenStorage initializes a variable of type *IStorage** with an *IStorage* pointer referencing the open file. *IStorage* is the OLE/ActiveX interface that programmers use to interact with storage objects. The *IStorage* pointer returned by *StgOpenStorage* points to the file's "root storage," which is analogous to a hard disk's root directory.

After opening the compound file, *UnfragFile* uses the API function *StgCreateDocFile* to create a new, uninitialized compound file in the system's "temp" folder:

```
IStorage* pOut;
hr = ::StgCreateDocFile (wszOutput,
    STGM_DIRECT | STGM_WRITE |
    STGM_SHARE_EXCLUSIVE |
    STGM_CREATE, 0, &pOut);
```


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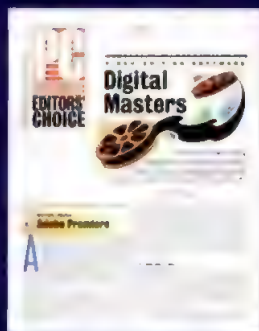
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```
if (FAILED (hr)) {
    pIn->Release ();
    return 0;
}
```

When `StgCreateDocFile` returns, the variable named `pOut` holds an `IStorage` pointer referencing the newly created file. At this point, the `UnfragFile` function holds two `IStorage` pointers: one (`pIn`) that references the original compound file and another (`pOut`) that references the new—and currently empty—compound file. With these pointers in hand, it's a simple matter for `UnfragFile` to unfragment the file.

The secret? Copy the input file to the output file using the `IStorage` function `CopyTo`. The statement

```
hr = pIn->CopyTo (0,
    NULL, NULL, pOut);
```

in `UnfragFile` uses `IStorage::CopyTo` to make an unfragmented copy of the input file. When `CopyTo` is called to copy a compound file, it copies the input file to the output file, filtering out any dead space in the process. In other words, when `CopyTo` returns, the output file holds an exact copy of the input file, *minus* the unused space inside the file. After computing a bytes-saved value by comparing file sizes, `UnfragFile` replaces the old file with the new one. To the user, it appears that the original file was unfragmented. In reality, a new, unfragmented copy of the file has replaced the old (and possibly fragmented) version.

CUSTOM BITMAP DISPLAY

Another facet of `Unfrag`'s source code that may interest programmers is the technique used to display the colorful bitmap in the left half of `Unfrag`'s main window. Generally speaking, displaying a bitmap in a dialog box is no big deal; you simply embed the bitmap in the dialog as a static control and let the dialog's built-in `WM_PAINT` handler do the drawing. But there's a problem. When you let the dialog draw the bitmap, there's no way to tell the dialog to use a color palette. If the bitmap contains colors other than the 20 colors in the default Windows palette (as `Unfrag`'s bitmap does), and if the display adapter is a 256-color device, then the bitmap's colors will be converted to the colors in the default palette. In many cases, the bitmap in the window will be a poor imitation of the original. How do you display a bitmap in a dialog and use a custom color palette, too?

The answer is that you draw the bitmap yourself using `BitBlt` or a related Windows

Beauty.

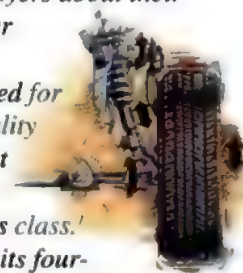


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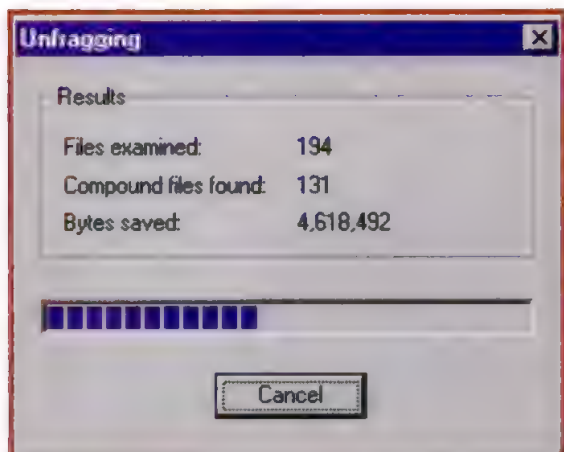


FIGURE 2: This dialog box informs you of Unfrag's progress.

"blit" function. And before you do the blit, you select a custom palette into the device context and realize the palette. This technique is no different from the one used to draw a bitmap in a conventional window. What's unusual is that programmers seldom write WM_PAINT handlers for dialog boxes (since dialogs paint themselves) but that in this case, there is little choice. If you wish to control how the bitmap is drawn, then you must be the one to do the drawing.

Here's how Unfrag handles it. For starters, the Unfrag dialog contains a dummy control (ID=IDC_IMAGE) that serves as a placeholder for the bitmap. At start-up, in the dialog's OnInitDialog function, the dummy control's coordinates are copied to a CRect member variable named m_rcImage. Then the dummy control is destroyed:

```
CWnd* pWnd =  
GetDlgItem (IDC_IMAGE);  
pWnd->GetWindowRect (&m_rcImage);  
ScreenToClient (&m_rcImage);  
pWnd->DestroyWindow ();
```

When the dialog needs repainting, its OnPaint function is called. OnPaint first calls the base class's OnPaint function so the dialog's default WM_PAINT handler will be executed:

```
CDialog::OnPaint ();
```

Then it creates a device context and uses the coordinates stored in m_rcImage to draw the gray and white border framing the bitmap:

```
CClientDC dc (this);  
dc.Draw3dRect (m_rcImage,  
RGB (128, 128, 128),  
RGB (230, 230, 230));
```

Finally, OnPaint "deflates" m_rcImage by 2 pixels in each direction and uses the StretchBlt function to draw the bitmap into the resulting rectangle:

```
CRect rect = m_rcImage;  
rect.DeflateRect (1, 1);  
CDC dcMem;  
dcMem.CreateCompatibleDC (&dc);  
CBitmap* pOldBitmap =  
dcMem.SelectObject (&m_bmSplash);
```

```
CPalette* pOldPalette =  
dc.SelectPalette (&m_palSplash,  
FALSE);  
dc.RealizePalette ();
```

```
dc.StretchBlt (rect.left, rect.top,  
rect.Width (), rect.Height (),  
&dcMem, 0, 0, m_cxSplash,  
m_cySplash, SRCCOPY);
```

```
dc.SelectPalette (pOldPalette,  
FALSE);
```

```
dcMem.SelectObject (pOldBitmap);
```

Before OnPaint blits the bitmap to the screen, it selects the bitmap's custom palette into the destination device context and realizes the palette. The palette, represented by the CPalette member variable m_palSplash, is initialized in OnInitDialog. OnInitDialog also loads the bitmap, which is stored as a resource in the application's .EXE file, and assigns it to the CBitmap member variable m_bmSplash.

You can judge this technique for yourself by running Unfrag first on a system that supports 16- or 24-bit color and then on a system that can display just 256 colors. The bitmap should look the same on both systems. To see what would happen if you left the dialog to draw the bitmap on its own, try commenting out the line

```
dc.RealizePalette ();
```

in the dialog's OnPaint handler and recompiling. Without the call to RealizePalette, a 256-color system will map the bitmap's colors to the nearest equivalents in the default Windows palette, and the image will undergo a pronounced (and unwelcome) color shift.

QUESTIONS ABOUT UNFRAG

If you have questions about Unfrag, post them in PC Magazine's online Utilities discussion area on the World Wide Web. To get there, point your browser to www.pcmag.com/discuss.htm and click *Utilities*. I'll try to make sure that no questions go unanswered. Meanwhile, enjoy a few free megabytes of hard disk space! **PC**

Jeff Proise is a contributing editor of PC Magazine.

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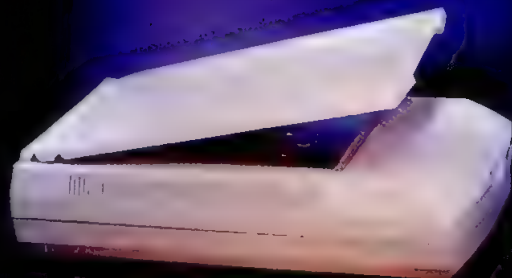
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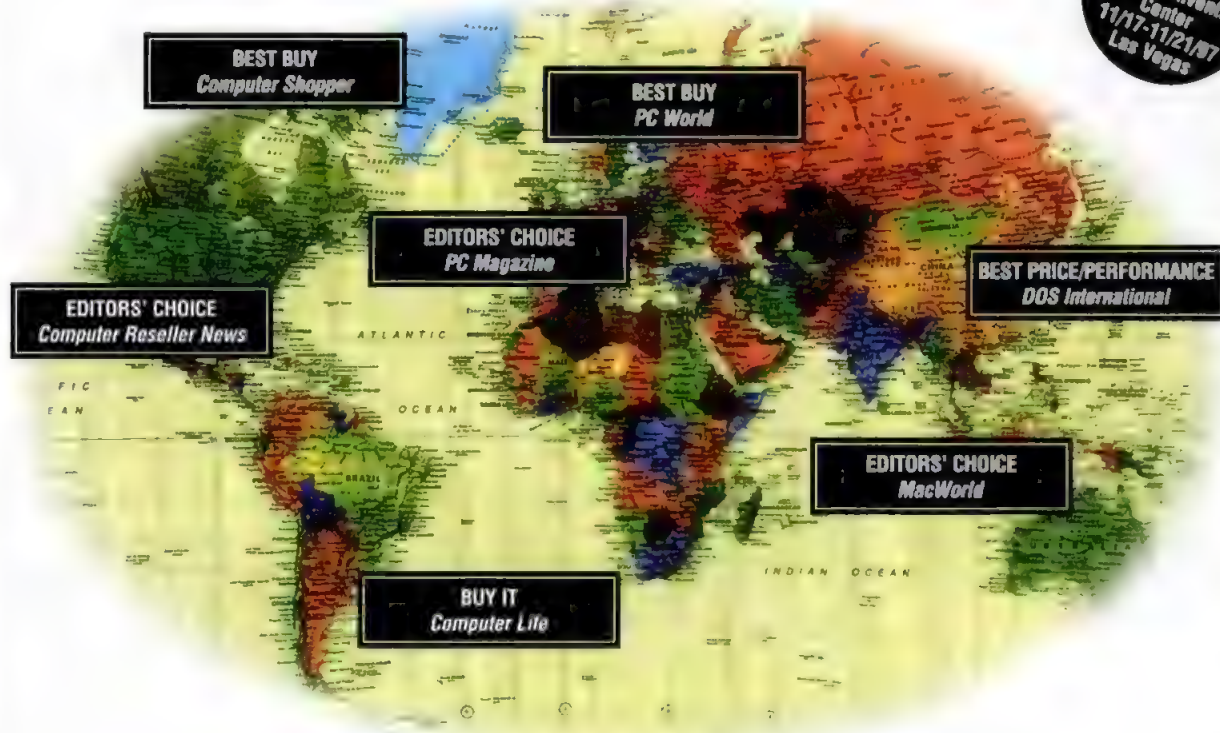
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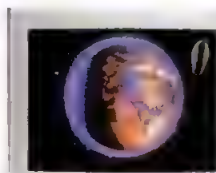
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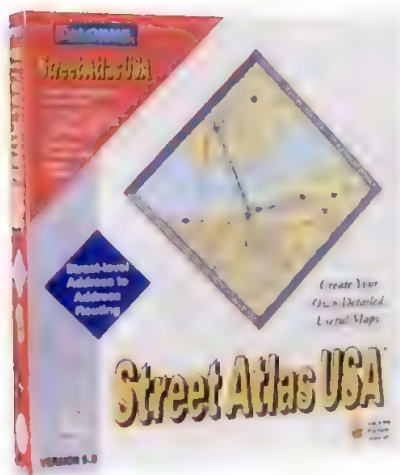


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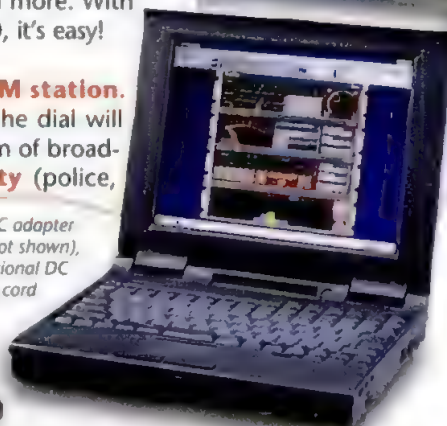
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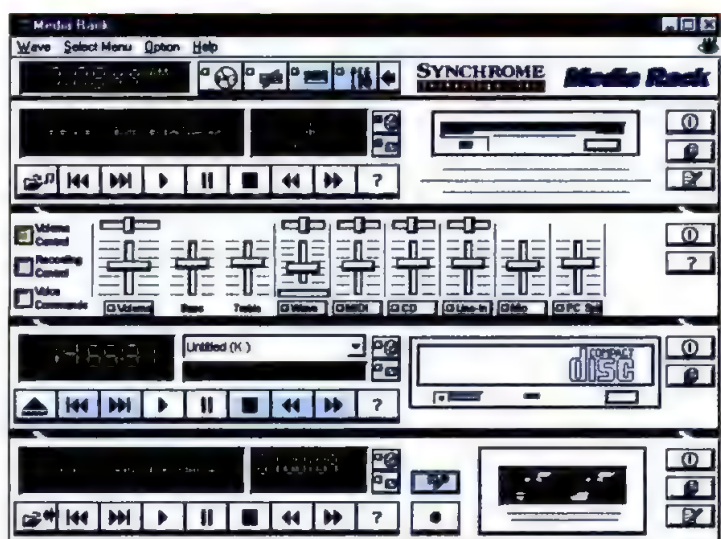
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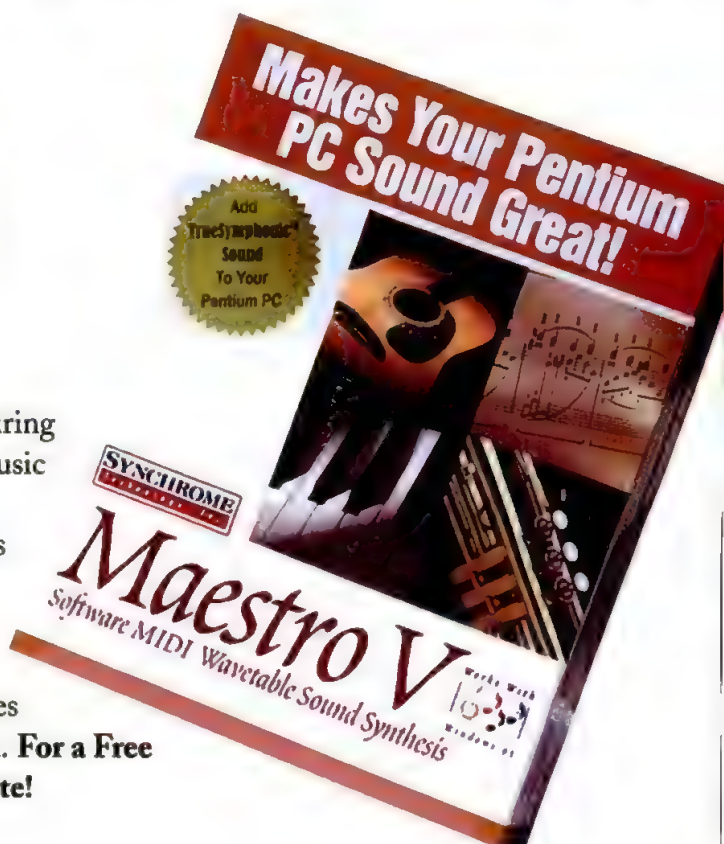
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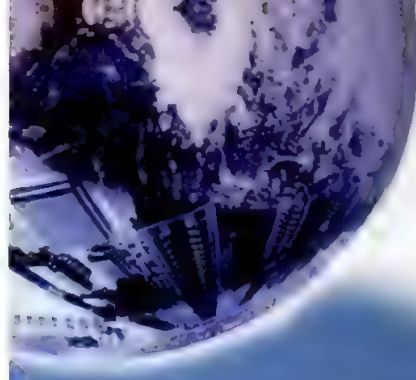
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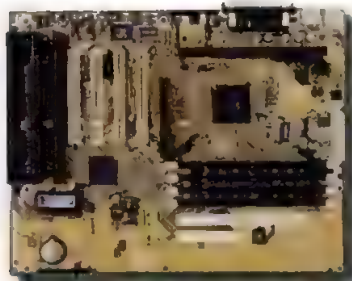
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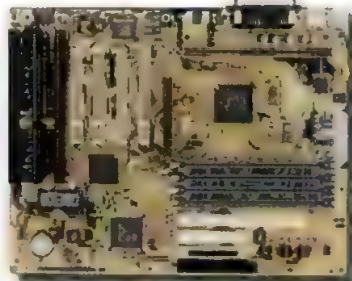
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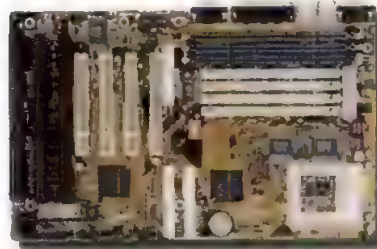
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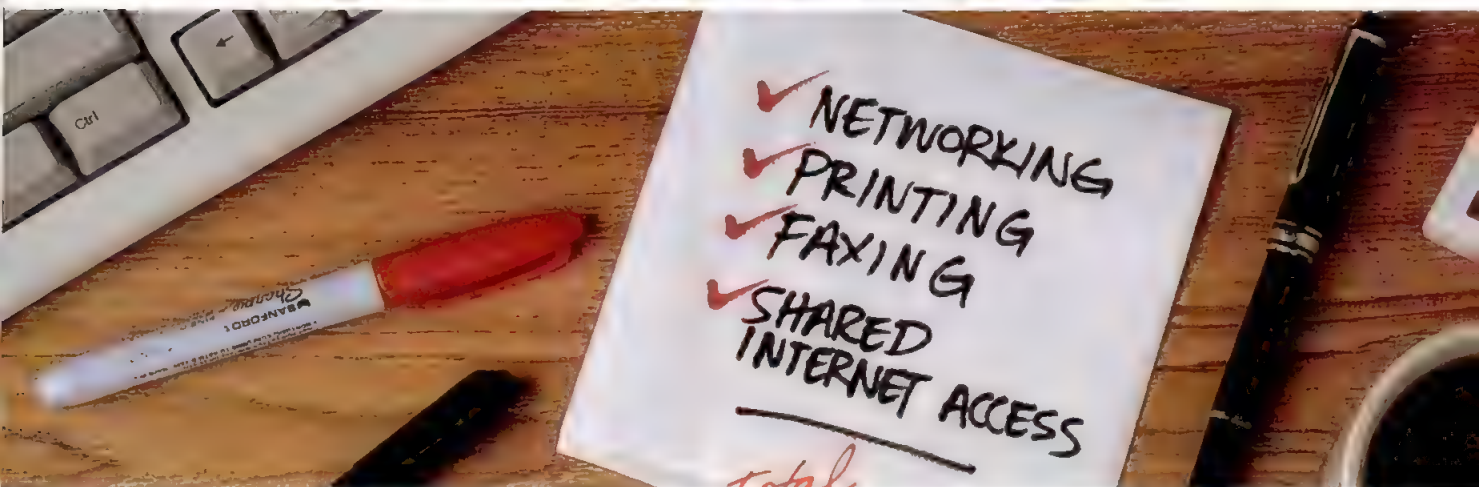
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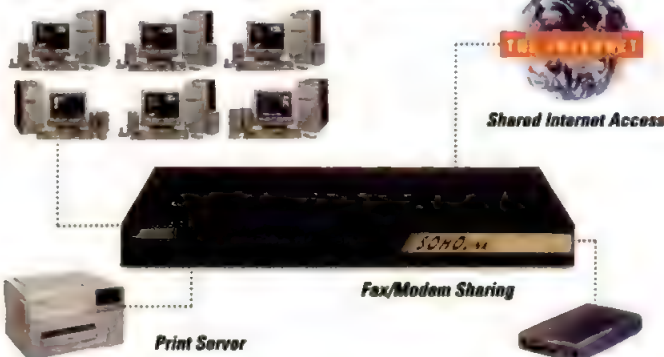
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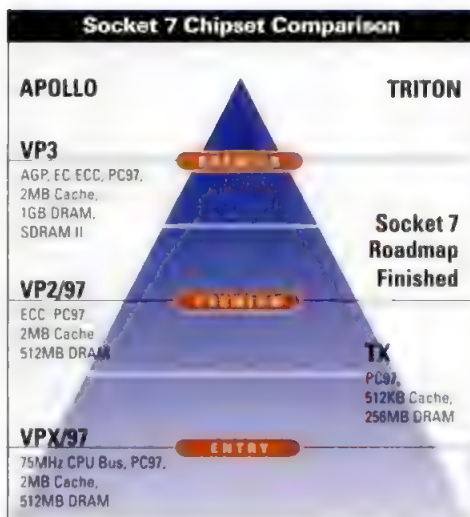


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User-to-User

BY NEIL J. RUBENKING

Clearing the TEMP Directory, Revisited

Your May 27, 1997, issue presented a way to keep the Temp directory clean, using the CHOICE command in Autoexec.bat to erase temporary files only when the system has shut down normally, without crashing. I've discovered a better way that doesn't rely on user response and doesn't slow down the boot process.

First change MSDOS.SYS's attributes so that you can edit it, then load it into a text editor. Find the line that reads BootGUI = 1 and change it to BootGUI = 0 (If the line doesn't exist, add it after the [Options] line.) Save MSDOS.SYS and reset its attributes. Now load Autoexec.bat into the text editor and at the end of the file add:

```
WIN
ECHO Y | DEL C:\TEMP\*.*
```

Save Autoexec.bat and reboot.

Now every time you shut down Windows 95 properly, all files in C:\Temp will be erased. But if your system crashes, all of the files will survive the reboot, including the AutoSave files. Note that you must recover all the needed files the first time you restart the computer after a crash; otherwise they will be erased the next time you shut down Windows 95. Note also that by default Windows 95 stores most of its temporary files not in the C:\Temp directory but in the C:\Windows\Temp directory.

PHILIP ALIZARI
Toronto, Canada

PC MAGAZINE: It's easy to forget that Windows 95 runs on top of its own special DOS version. Indeed, if you set BootGUI=0 in MSDOS.SYS and launch Win.com from your Autoexec.bat, the remaining lines of Autoexec.bat will be processed after you shut down Windows 95. If the system crashes, naturally these same lines will not be processed.

If you launch Win.com from Autoexec.bat, you actually return to the DOS prompt after shutdown. You can't see it, because the shutdown logo obscures the prompt. But if you move LOGOS.SYS from the Windows directory to another location, or add MODE C080 to the end of your Autoexec.bat, you'll gain access to the DOS prompt. Some Microsoft documentation states that the system is in an "unstable state" when this occurs, but I haven't heard of any specific problems occurring.

You may prefer to use the command DELTREE /Y C:\TEMP*.* to delete all files and

directories within the Temp directory, while leaving the Temp directory itself intact. And whichever command you choose, you may want to apply it to C:\Windows\Temp as well. Naturally you'll change the directory names if necessary to reflect the actual location of your temporary files.

Reserving a Letter for the CD-ROM Drive

To prevent the CD-ROM drive letter from being changed when hard disks are added to a computer system, you need to reserve a specific letter for the CD-ROM drive. The letter should not be D:, and it should be high enough in the alphabet to accommodate any other drives you might add. Reserving a letter is also a good idea if your system accesses a network. I use R:.

It's best to do this before installing any software that uses the CD-ROM drive, though it will work even after you install such software. Some previously installed programs will prompt you to select a different drive. You may have to reinstall others to get them to use the new drive letter.

To insure that the same drive letter is used

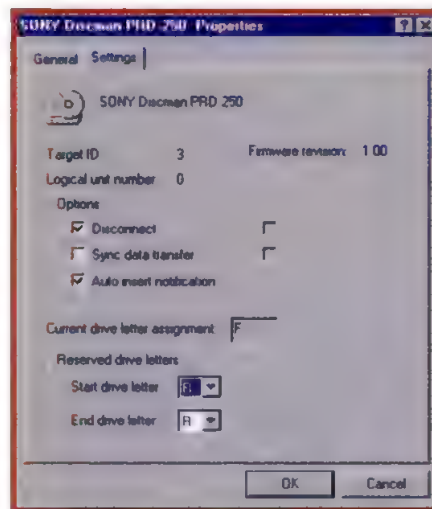


FIGURE 1: By setting the maximum and minimum drive letters for the CD-ROM to the same value, several letters higher than the last logical-drive letter, you can keep the CD-ROM letter from changing unexpectedly.

both for the command mode and within the GUI for Windows 95, you need to load the device driver for your CD-ROM drive from CONFIG.SYS, and you must load MSCDEX.EXE in AUTOEXEC.BAT. Find the MSCDEX.EXE line and append the command line switch /L:R—for example,

```
LOADHIGH C:\WINDOWS\COMMAND\
MSCDEX.EXE /D:MSCD001 /L:R
```

Then open Control Panel and double-click on the System icon to load the System Properties applet. Click on the Device Manager tab, then on the Plus sign to the left of CD-ROM. Click once on the CD-ROM drive that is listed. Now click on the Properties button and then on the Settings tab. In the "Reserved drive letters" box, change Start drive letter: to R:. End drive letter: should change automatically to R:. If it doesn't, click on the arrow and select R: from the list. Click OK twice to finish up, then click on the Yes button to restart your computer so the new setting will take effect.

NIKI CHIN
Brooklyn, New York

PC MAGAZINE: If your CONFIG.SYS and AUTOEXEC.BAT don't already have entries for the CD driver and MSCDEX respectively, your first step should be to get those drivers working without changing the CD-ROM letter. First, back up CONFIG.SYS and AUTOEXEC.BAT. Now follow the instructions above, but replace R in /L:R with the current CD-ROM drive letter. Restart your system. When the words "Starting Windows 95" appear on the screen, press F8 and select *Command Prompt Only* from the menu. Put a CD-ROM in the drive and confirm that you can access it.

Note, too, that the LastDrive= setting in CONFIG.SYS limits the range of drive letters you can assign to the CD-ROM. If LastDrive= is set to a value lower than the letter you want to use, raise it. Once that's taken care of, change the /L: switch to R, or whatever higher letter you've chosen, and proceed with the instructions for changing the drive letter within Windows 95 as well. Figure 1 shows the property dialog for the CD-ROM drive.

Of course, any CD-ROM programs that you installed earlier will now be unable to find the CD-ROM drive. Some will ask you for the new location; others will simply fail to run. You can use the PC Magazine utility COA32 to notify the system of your CD-ROM's change of address. Use the old drive letter followed by a colon as the old address, and use the new letter followed by a colon as the new address. In most cases, this will allow your CD-ROM programs to run from the new letter. Now you can add a disk, remove a disk, or change the number of partitions without having the CD-ROM letter change every time.

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• Winners will receive a notebook or desktop computer from Compaq, Hewlett-Packard, IBM or Toshiba. Microsoft Office 97 Professional Edition with BonusShed Basics, included with awarded computer systems. ViewSonic monitors awarded with desktop computers only. No substitution of the prize is permitted. Due to changing market conditions, product awarded may differ from those featured in this advertisement. • The prize drawing will be conducted on or after February 28, 1998, from entries postmarked by January 9, 1998. Limit one entry per address. When you place an order, you are automatically entered to win. Or enter via our site on the Internet World Wide Web: www.cdw.com. Entries are also accepted via eUS Mail, with the consent form on this page on a 3 x 5 piece of paper. All entries must include your name, company name if any, address including zip code, and your daytime phone number. Entries must be received in a sealed, addressed #10 envelope with sufficient first-class postage affixed. Mechanically reproduced entries or entries not meeting the above requirements will be disqualified. • CDW Computer Centers, Inc. will not be responsible for late, misdirected, lost, undelivered, destroyed or illegible entries. Winners will be selected in a random drawing. Prizes will be awarded and winners notified by mail. Potential winners must respond to the notification within 15 calendar days of mailing. Failure to respond within the 15 day period may result in disqualification and an alternate winner may be selected. Prizes not claimed returned as undeliverable will result in disqualification. Odds of winning will be determined by the number of eligible entries received. All prizes will be awarded. Winners must be U.S. residents and at least 21 years of age at the time of entry. • Employees of CDW and their immediate family members are not eligible. This contest is void where prohibited by law. Winning will not be transferred or substituted for the awarded prize. Applicable federal, state and local taxes are the sole responsibility of the winner. All federal, state and local laws apply. Participants in this promotion agree to be bound by the official rules and decision of the judges. For a list of winners, after February 28, 1998 send a self-addressed stamped envelope (SASE) to: CDW Computer Centers, Inc., CDW Winning IS Everything Giveaway, P.O. Box 8129, Vernon Hills IL 60061.



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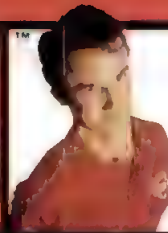
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Mini-tower	CPU	RAM	Hard drive	CD-ROM	Price	CDW
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8032	166MHz Pentium MMX	16MB/128MB	2.1GB	16X Max	—	\$1149.54	95054
8034	200MHz Pentium MMX	32MB/128MB	2.1GB	16X Max	—	\$1419.35	95055

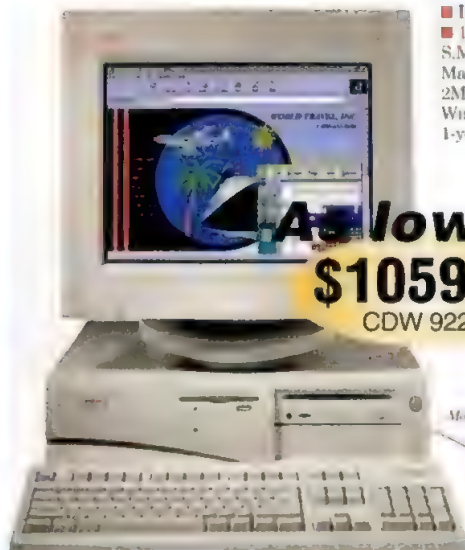
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520X/3200	200MHz Pentium MMX	32MB	3.2GB	—	\$1339.00	92841
520X/3200/CDS	233MHz Pentium MMX	32MB	3.2GB	16X Max	\$1719.00	92843
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6233/3200/CDS	233MHz Pentium II	32MB	3.2GB	24X Max	\$1989.00	95917
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Mini-tower	CPU	RAM	Hard drive	CD-ROM	Price	CDW
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380ED	166MHz Pentium MMX	16MB	2.1GB	20X	12.1" dual scan	\$2429.85	94542
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560E	150MHz Pentium MMX	16MB	2.1GB	11.3" dual scan	\$2149.25	89290
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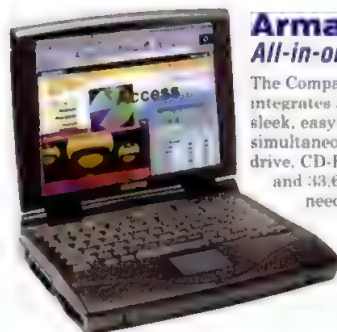
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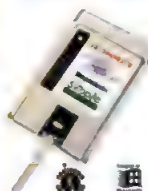
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Logitech PageScan for Windows 95	259.65
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Microtek ScanMaker E6 std color flatbed	284.34
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Play Snappy video still capture	139.15

INPUT DEVICES

Ricoh RDC-2 digital camera	599.00
UMAX Astra 600P scanner	149.95
UMAX Astra 600S scanner	168.64
UMAX Astra 1200S scanner w/PhotoDeluxe	279.07
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MONITORS

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MAG InnoVision 510V2 15" 0.28mm	298.44
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Hayes ACCURA 56K	189.76
Hayes OPTIMA 56K	198.14
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16-bit PC Card adapter	148.89
Intel EtherExpress PRO/100	148.89
32-bit Card Bus adapter	158.10
Motorola Manner 33.6K	359.16
Motorola ModemSURF 56K	167.22
New Media PC Card joystick adapter	59.75
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Simple 33.6K cellular	149.74
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Xircor 33.6K Ethernet combo	279.85

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OPTIMA 33.6K Business Modem external	188.04
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HARDWARE

The Scoop on Scanners

I need to scan text from documents, without color or photos or anything else. What are the minimum and maximum scanner setups that are appropriate?

J. M. HAYES

Binghamton, New York

PC MAGAZINE: At the low end there are personal scanners, which are generally single-sheet devices with a small footprint on your desk. (At the very low end are the handheld scanners, but these tend to be slower, more difficult to use, and of lower quality than the personal scanners.) The high end includes some high-speed dedicated devices that can cost a great deal of money; a flatbed scanner with an automatic document feeder (ADF) might be a more affordable option.

If you want to scan only text, the logical assumption is that you intend to process the image with optical character recognition (OCR) software so that you can edit the information in a word processor or other program. Fortunately, most OCR packages have relatively modest requirements as to scanners. For most text a 300-dot-per-inch scan will do, though some programs recommend 400-dpi scans for 8-point text or smaller. Some programs work well with a simple black-and-white scan (one bit per pixel), though some can take advantage of 256-level gray-scale scans to increase accuracy.

Most personal scanners can meet these requirements easily. Many rely on parallel-port connections and are thus easy to install and configure, but a parallel-port connection is not all that fast, and you may have problems with a printer hooked up to the pass-through connection. Another limitation is that personal scanners tend to be single-sheet devices. You cannot load in a stack of papers or scan bound pages, such as those in books and magazines.

A flatbed scanner is more versatile. You'll be hard-pressed to find one that does not offer color scanning, but even with color, a variety of models are \$500 or less. Most flatbeds rely on SCSI connections, which are much faster than parallel-port connections; many scanners come with their own SCSI adapters. Many flatbed scanners also offer automatic document feeding.

Keep in mind that even an OCR package that claims 99 percent accuracy will make a

significant number of mistakes. A typical double-spaced typewritten page has up to 2,000 characters on it, so 99 percent accuracy could result in 20 errors on one page.—*Alfred Poor*

Printer Memory Versus System Memory

A salesperson at the computer store said there is a difference between laser printer memory and computer system memory but couldn't explain how they differ. Is laser printer memory different from standard SIMMs, and if so, how?

BILL MERTENS

State College, Pennsylvania

PC MAGAZINE: The memory chips used on printer memory modules constitute the same dynamic memory (DRAM) used for most computers. The only difference is the modules' design.

Many printers use proprietary memory modules, as do most notebook computers. You can get these from the printer manufacturer or, in many cases, from third-party memory manufacturers such as Kingston or PNY.

The good news is that in recent years, printer designers have begun to use industry-standard SIMM configurations. This saves money in the long run, as economies of scale mean that the standard modules sell for less than the proprietary parts.—*Alfred Poor*

OPERATING ENVIRONMENTS

Accessing HPFS Under Windows NT 4.0

OS/2 used to be my main operating system, but now I need to use Microsoft Windows NT as well. The problem is that I need to upgrade from Windows NT 3.51 to Windows NT 4.0, and Microsoft has dropped HPFS support in Version 4.0. I have to be able to get to my OS/2 partitions from Windows NT. Is there a way that I can do this?

HARRY AMES
via the Internet

PC MAGAZINE: There is, but it isn't supported by Microsoft: You have to use the HPFS device driver from Windows NT 3.51. Make a copy of the file Pnball.sys from the %systemroot%\System32\Drivers subdirectory of your Windows NT 3.51 partition. Then install Windows NT 4.0 normally, and copy Pnball.sys into the %systemroot%\System32\

Drivers subdirectory of your Windows NT 4.0 partition.

Finally, you need to let Windows NT know that the device driver exists. Click on *Start | Run*, then type REGEDIT to start the Registry Editor. In the Registry Editor's left window pane, click on HKEY_LOCAL_MACHINE to expand that folder. Within the folder click on SYSTEM, and within the System folder click on *CurrentControlSet* and then on *Services*. Make sure *Services* is highlighted as shown in Figure 1.

To add new keys to the Registry, click on *Edit*, then on *New*, and then on *Key* on the Registry Editor's menu bar. First you will need to add the key PINBALL. Then, with PINBALL still highlighted, you can add values to the PINBALL key.

Click on *Edit*, then on *New*, and then on *DWORD value*, and change the new key's name to *ErrorControl*. Then, with *ErrorControl* still highlighted, right-click on *Modify*. The *Edit DWORD Value* dialog will pop up, allowing you to set the value for this key. Set *Value data* to 1, and set *base* to *Hexadecimal*.

Next click on *Edit*, then on *New*, and then on *String value*, and change the name of the

OUR ADVISORS

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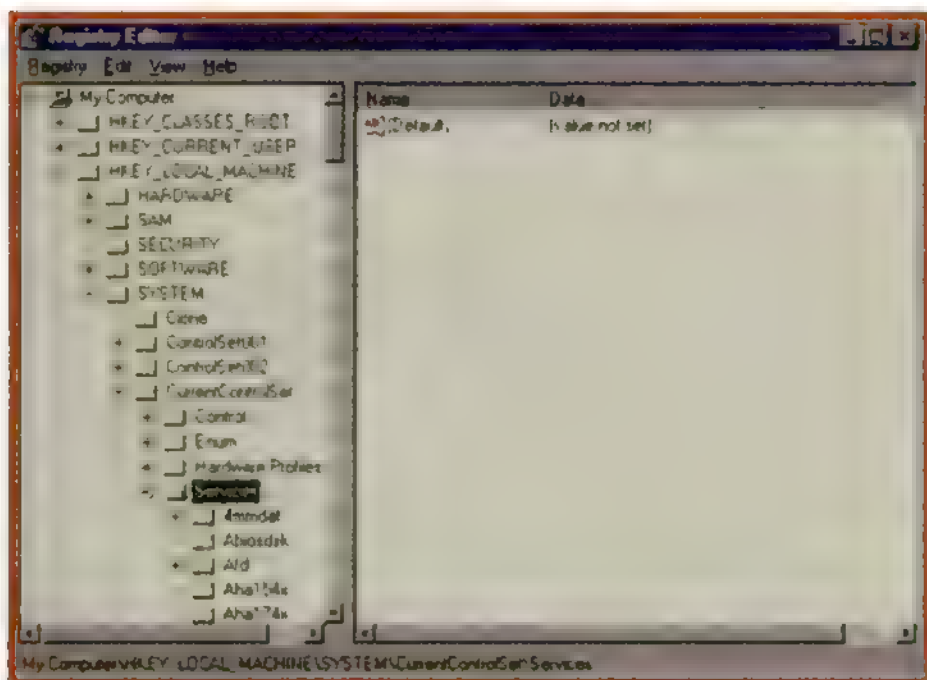


FIGURE 1: To add HPFS support to Windows NT 4.0, you use a Windows NT 3.51 driver, then edit the Registry so that Version 4.0 will “see” the driver.

new key to Group. Right-click on *Group* and select *Modify*, then change the value to *Boot file system*.

Finally, add two more DWORD values. Name the first *Start*, with a value of hexadecimal 1, and name the second one *Type*, with a value of hexadecimal 2. Your Registry should resemble Figure 2.

When you reboot the system, you should be able to access OS/2 HPFS partitions just as you did with Windows NT 3.51. But keep in

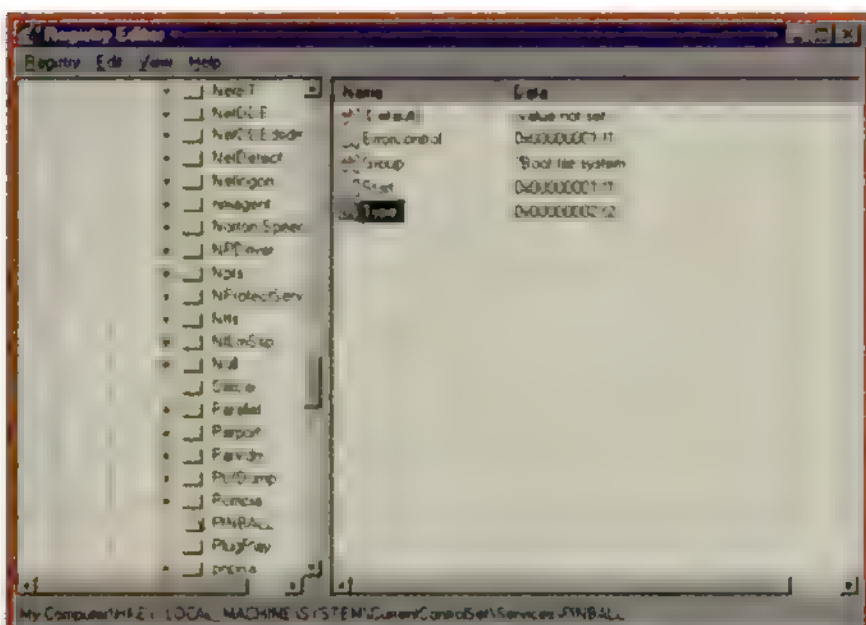


FIGURE 2: The new keys and values you add to the Windows NT 4.0 Registry let the operating system know the Version 3.51 driver exists.

mind that some new features of Windows NT 4.0, such as the Recycle Bin, won't work with the HPFS partition.—*Brian Proffit*

Windows 95 and DOS 7—Mated for Life

Is DOS 7 useful on a system running Microsoft Windows 95? Can it improve performance, especially for games? If so, should I install it before or after installing Windows 95?

SCOTT ZIGLER
via the Internet

PC MAGAZINE: The only version of DOS that can possibly run in conjunction with Windows 95 is DOS 7. This version is effectively part of Windows 95 and is automatically installed along with that OS. It is possible to retain your old DOS version during Windows 95 installation and to “dual-boot” into that version. But the two operating systems—old DOS and Windows 95—will be mutually exclusive: If one is active, the other will not be. In short, a DOS version other than the built-in DOS 7 can have no effect on Windows 95 performance.—*Neil J. Rubenking*

WORD PROCESSING

Moving to a Word Text Box With Keyboard or Macro

Word doesn't seem to have a macro command for moving to a text box—at least, it doesn't have one that Microsoft technical support could suggest. This could be a problem if you need to move to a text box, copy the text, and then paste it into another document as part of a macro.

I have discovered a way to move to a text box in Word 6. Assume the documents you need to copy from are based on a template that places the text box at the top of the page, within ten spaces of the left margin. Add ten spaces on the first line of the template, so that the spaces are behind the text box. You can now, in Page Layout view, move the cursor inside the text box with four lines in the macro:

```
StartOfPage
EndOfLine
PageDown
PageUp
```

At this point, you can select and copy the text from the text box. To leave the text box when you're finished, simply insert a PageDown in the macro.

ANTON MELUMAD
via PC Magazine Online

PC MAGAZINE: I haven't been able to figure out why this technique works, but it does—not just in Word 6, but in Word 7 and Word 97 also. And note that in Word 97, it works both

for text boxes and for AutoShapes with text. As it happens, there's a more elegant way to deal with text boxes (or AutoShapes) in a macro, but for those who prefer the keyboard to a mouse, this is a useful workaround for the lack of a keyboard command for moving into a text box.

The basic trick here is to define a line of body text so that it overlaps with the text box. Once you move the cursor to an overlapping position, two quick keystrokes—PageDown, PageUp—will move the cursor inside the text box and let you edit the text. When you're finished, you can leave the text box by hitting either the PageUp or the PageDown key. And of course, you can add an overlapping line for each text box in your document.

One useful refinement to speed keyboard navigation when there's no text on the body text line is to define the paragraph so that the left margin starts at a position overlapping the text box—a trick that bypasses the need to add spaces. The simplest way to handle this is with Word's Ruler. Place the cursor in the appropriate paragraph, move the mouse to the small rectangle under the first line-indent and paragraph-indent markers (the up- and down-facing arrow-shaped pointers on the left side of the ruler), and then drag the left-margin markers so that the left margin falls within the text box.

As I've already suggested, there are better ways to get to a text box as part of a macro. If there is only one text box in the template, in Word 6 or Word 7, you can use the commands

```
DrawSetRange "\doc"
DrawSelect 1
DrawsSetInsertToTextbox
```

The first line sets the range to the entire document, the second selects the first (and in this example, the only) object in the range, and the third puts the cursor inside the selected text box.

In Word 97 you can read the contents of a text box and insert them at the current cursor position with just these lines:

```
Set Stuff = ActiveDocument.Shapes(1)
.TextFrame.TextRange
Selection.TypeText Text:=Stuff
```

Here the first line sets the variable *Stuff* to equal the text in the first (and in this example, the only) shape in the document. (Shapes include text boxes.) The second line inserts the value of *Stuff* at the current cursor or selection position.—*M. David Stone*

SPREADSHEETS

Displaying Cell Contents in a Chart Text Box

I want to display cell contents (data derived from a calculation and converted to text) in a text box on a chart. Is there any way to accomplish this in Excel?

PETE SAVOIA
via the Internet

PC MAGAZINE: Yes, but you can waste a good afternoon looking for it. Display the drawing toolbar, click the text box tool, and drag out the area on your chart where you want the cell text to appear. Then, while the text box is selected, click on the formula bar and enter a reference to the cell whose text you want to capture.

The simplest way to create this formula is to type an Equal sign, then use your mouse to point to the cell in question. If you simply type a reference in the form =A1, Excel will complain, because it wants a sheet reference in addition to the cell reference. Point to the cell and Excel will give you the formulation it desires.—Craig Stinson

Spelling Out Bigger Numbers

Thanks for the Excel function for spelling out numbers (Ask Our Advisors, August 1997). But I'd like to modify it so that it can go up to 999,999,999.99. I am in the construction business and could conceivably bid projects in the hundreds of millions of dollars. Our bid forms often require numbers and words.

Also, in Excel 97, how can you store workbook defaults—such as Precision as Displayed, Iteration, or Grid Lines Off—for all opened (new) workbooks? I've been trying to figure this one out for a long time.

BOB LONG
via the Internet

PC MAGAZINE: A modified version of Spell.xls is now available for download from PC Magazine Online. Because spelled-out numbers in the millions typically use on the order of 100 characters, I've added a bit of rudimentary error checking to the function. If the maximum width you specify (the width to which the function pads with asterisks) is less than the width of the spelled-out number, the function displays a message box and retires. (Without this check, Excel would return a #VALUE! error.) You'll also get message boxes now if you try to spell out a number larger than 999,999,999.99 or smaller than 0.

To change the workbook defaults in any recent version of Excel, follow these steps: 1. Open a blank workbook.

2. Use the Tools | Options command to set up the defaults you want.

3. Save the workbook to your Xlstart directory, as a template named Book.xlt.

To save the workbook as a template, choose Template from the Save as Type dropdown in the Save As dialog box. Be sure not to accept Excel's proposed filename—Book1.xlt. It needs to be Book.xlt, with no number after Book.

The Xlstart directory must be directly below the directory containing Excel.exe. Any Excel workbooks or templates in this directory get loaded into memory automatically every time you start Excel. If a template named Book is there, that becomes the template for all new workbooks.—Craig Stinson

DATABASES

Printing First and Last Page Numbers for Report Groups

I'm working on a new employee report. There are several pages for each person; some employees have more, some fewer. Currently I am printing each person's report separately, because I want the ending page number to reflect that report's number of pages. For example, employee number-one might have 5 pages, in which case the first page would be Page 1 of 5 and the last would be Page 5 of 5. And employee number-two might have 2 pages, printed as Page 1 of 2 and Page 2 of 2. If I don't print the reports separately, a report's ending page number reflects the ending page number for the entire set of reports (for example, Page 5 of 10,264).

Is there any way to create a group report that resets the starting and ending page numbers when the name of the employee changes?

JERRY BRANSFIELD
Chicago, Illinois

PC MAGAZINE: Not without writing code. Microsoft Access has two report properties, called Page and Pages, that hold the current page number and the total number of pages, respectively. But these values are for the entire report. If you create a report grouped by employee there's no way, short of writing custom code, to determine the total number of pages for each group (each employee).

Access needs something like the Page and Pages properties—but for groups. Until that happens, you'll have to adopt a technique such as Grppag.mdb, which we've made available on PC Magazine Online. You might be tempted to experiment with using the Pages property in a subreport, but don't bother. If you use it in a subreport, its value is always 0. The following solution is based partly on a technique I found in a Microsoft Knowledge-Base article (you can obtain article Q131937 at support.microsoft.com/support/kb/articles/Q131/9/37.asp or via Microsoft's Technet CD-ROM subscription service). The technique requires an additional table in your database and works reliably only for single-user databases. But it otherwise gets the job done.

The idea is to accumulate each group's page count in a table as Access processes the first pass of the report. As each group is processed, the page footer's code updates the table with the page number. When the program has finished formatting a group, the page count record will hold the group's total number of pages.

For this to work, Access has to process the report in two passes. During the first pass, it accumulates the page counts in the page counts table and sets the report's Pages property to the total number of pages. It prints the report during the second pass. By that time, the page count table has all the information we need to produce Page *n* of *m* for the group.

Note that you need to use the Pages property

somewhere in your report for Access to use two-pass formatting. If you want to use the technique without printing the Pages property's value, create a text box somewhere on your report, set its ControlSource property to =[Pages], and then set its Visible property to No.

Grppag.mdb is for a report called Employee Sales, shown in Figure 3. For this example, I created a table called Employee Report Page Counts (hereafter the *page counts* table) and added two fields: EmployeeID and Page Count. Both are Number-type fields, and Em-

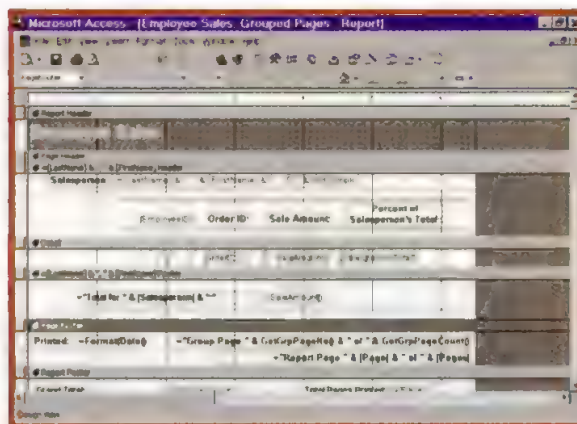


FIGURE 3: This report design lets you print "Page *n* of *m*" accurately both for single employee reports and for the entire set of reports in the page footer.



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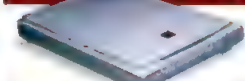
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Group Page 1 of 2
Report Page 1 of 35

FIGURE 4: The footer in the sample employee report appears this way when printed.

employeeID is the PrimaryKey. The table's purpose is to hold one row for each employee in the report, as represented by the person's unique Employee ID, containing the total number of pages for that employee's group. The code in the report adds the rows to the table when Access processes the report.

When the Employee Sales report is previewed or printed, the report's On Open event is triggered and calls the Report_Open subroutine. This code empties the page counts table so that we can begin afresh and start accumulating the next group's page count. As Access formats each page, the Page Header's On Format event calls the PageHeader_Format procedure, which increments the current group's page number. When Access reaches the bottom of the page, the Page Footer's On Format event calls the PageFooter_Format procedure. This code updates the page count for the current employee in the table. If a row for the em-

ployee doesn't exist, it's added to the table.

When a new group begins, the Group Header is formatted. The Group Header's On Format event calls the GroupHeader_Format procedure, which restarts the group page number at 1. Because the Group Header can also be repeated at the top of every page if the RepeatSection property is set to True, it's sometimes formatted in the middle of printing a group instead of only at the beginning. The code keeps track of the current employee and restarts the page number only if the employee changes.

These procedures do the bulk of the work—creating and updating the employee rows in the page counts table. Once that table has been successfully populated, the GetGrpPageCount function is used to locate and obtain the page count for a given Employee ID. This function is called from a Page Footer text box to construct the *Group Page n of m* text shown in Figure 4.

You can download the entire example with the tables, code, report, and sample data from PC Magazine Online (www.pcmag.com). Look for the file named Grppag.mdb. The file is in Microsoft Access 97 format.

—Sal Ricciardi

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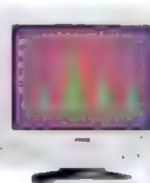
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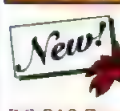
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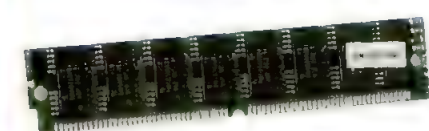


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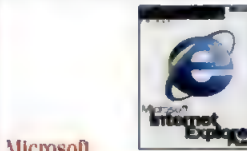


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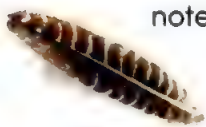
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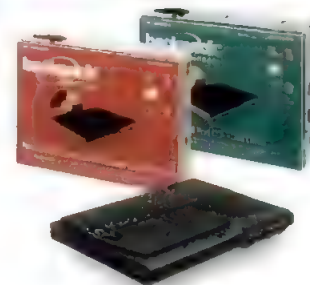


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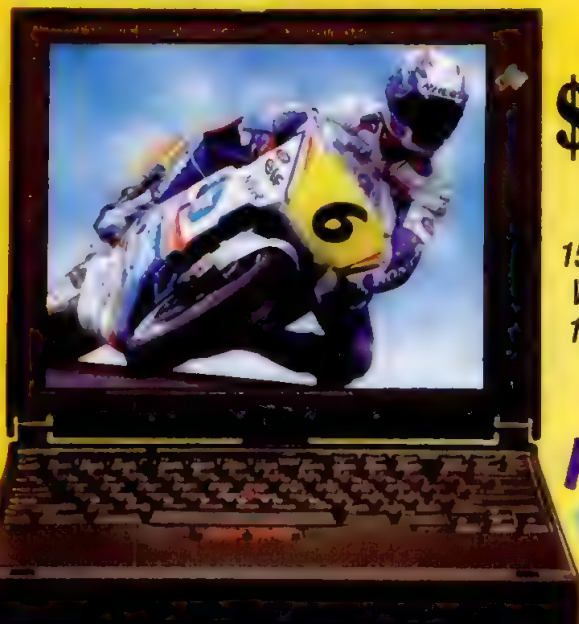
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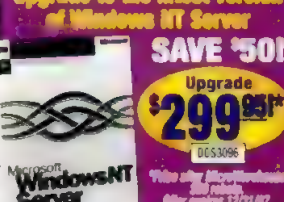
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2000MB	4500	JTS	JTS2000	\$153
2000MB	5200	Western Digital	AC22000	\$179
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2557MB	4500	Seagate	ST32531A	\$177
2559MB	5200	Western Digital	AC22500	\$175
3000MB	4500	JTS	JTS3000	\$185
3166MB	5200	Western Digital	AC33000	\$205
4000MB	5200	Western Digital	AC34000	\$243
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SCSI	RPM	Brand	Model	Price
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3228MB	5400	Quantum	FB33240S	\$276
4304MB	5400	Micropolis	MC4743	\$319
4310MB	5400	Quantum	FB34320S	\$314
4400MB	7200	Fujitsu	M2945S	\$539
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4580MB	7200	Seagate	ST34572N	\$523
4580MB	7200	Quantum	VK34550S	\$463
4580MB	7200	Quantum	XP34550S	\$522
4580MB	7200	Seagate	ST34501N	\$609
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9100MB	7200	Fujitsu	M2949S	\$889
9100MB	7200	Quantum	XP39100S	\$819
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2275MB	7200	Quantum	XP32275W	\$299
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4400MB	7200	Fujitsu	M2945W	\$550
4580MB	7200	Micropolis	MC4345W	\$509
4580MB	7200	Micropolis	MC4345WAV	\$559
4580MB	7200	Seagate	ST34572W	\$525
4580MB	7200	Quantum	VK34550W	\$505
4580MB	7200	Quantum	XP34550W	\$568
4580MB	7200	Seagate	ST34501W	\$699
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9091MB	5400	Micropolis	MC3391WAV	\$859
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9100MB	7200	Quantum	XP39100W	\$913
9100MB	7200	Seagate	ST19171W	\$949
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24X	Pioneer	DRX24X	75	\$91	
24X	Mitsumi	CRMCFX24X	90	\$95	
24X	Toshiba	XM6102B	85	\$95	
32X	Teac	CD532E	84	\$105	

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Speed	Brand	Model	# Disks	Int
6X	NEC	CDR4X6	4	\$79
8X	NEC	CDR4X8	4	\$99
12X	Panasonic	SQTC512N	5	\$266
16X	Nakamichi	MJS16A	5	\$169

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Speed	Brand	Model	ms	Int
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12X	Plextor	PX12CS(caddy)	105	\$247
16X	NEC	CDR1610	100	\$115
20X	Plextor	PX20TS	95	\$219
24X	NEC	CDR1810	85	\$139
32X	Teac	CD532S	85	\$Call
32X	Plextor	tray or caddy	85	\$Call

SCSI CD CHANGERS				
Speed	Brand	Model	# Disks	Price
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SCSI CD TOWERS			4 Drive	7 Drive
16X	NEC	100ms	\$859	\$1499
20X	Plextor	95ms	\$1259	\$2219
24X	NEC	85ms	\$959	\$1649
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Ethernet 7 CD TOWERS			10-T	100-T
16X	NEC	100ms	\$2249	\$2449
20X	Plextor	95ms	\$2969	\$3169
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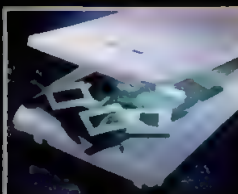
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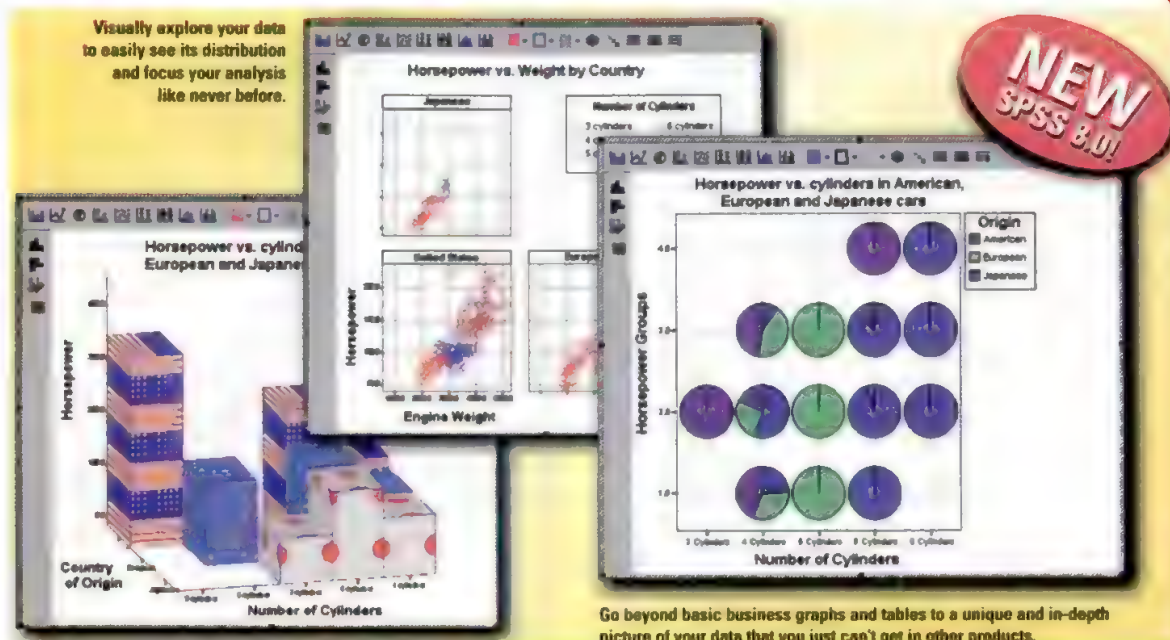
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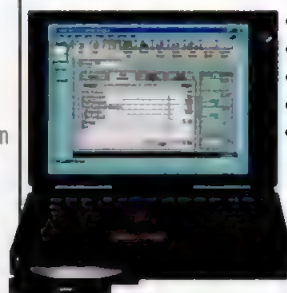


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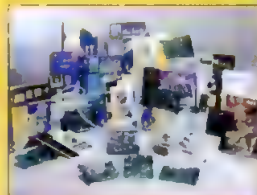
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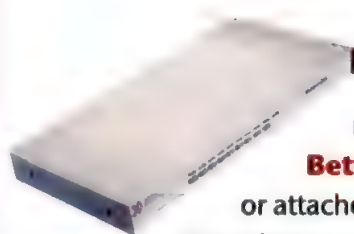
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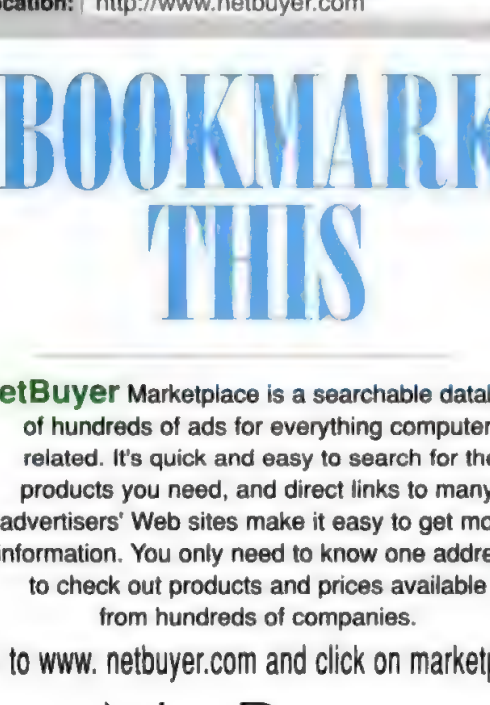
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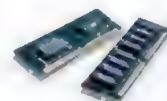
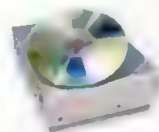
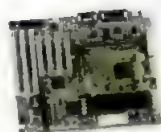
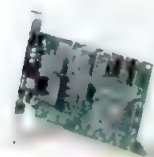
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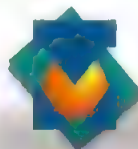
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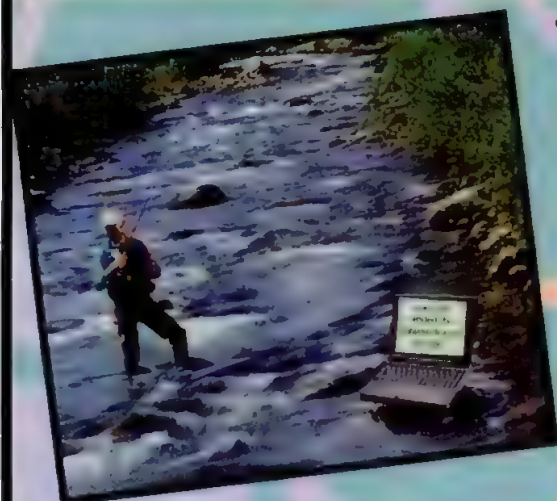
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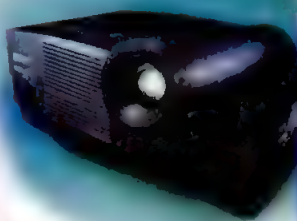
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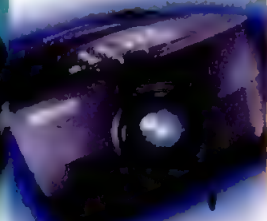
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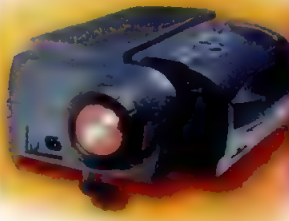
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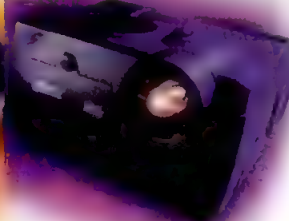
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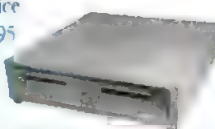
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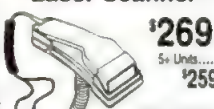
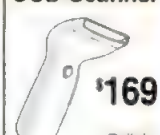
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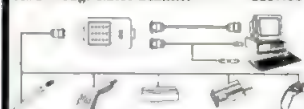
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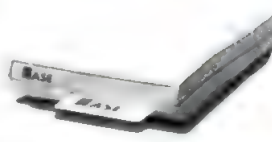
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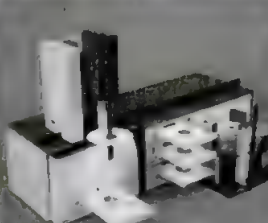
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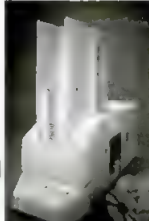
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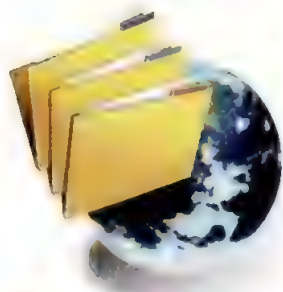
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After Hours



Great Gift Ideas

By Michael E. Ryan and Karen J. Bannan

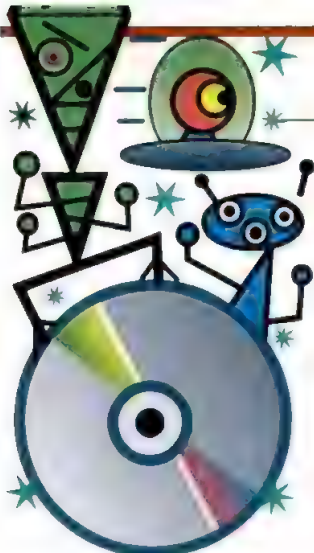
IT'S THAT TIME OF YEAR AGAIN: TIME TO celebrate the holiday season and time for *PC Magazine's* fourth annual holiday gift guide. This year, we've concentrated almost exclusively on software, simply because this is when the vast majority of consumer titles hit the shelves. Also, please note that in order to accommodate our editorial schedule, we reviewed many of the products in this guide in their prerelease (or beta) stages. This means that although all of the products included here *should* make it out in time for the holidays, some may not. We chose these titles as the most promising of this holiday season and based our opinions on hands-on evaluations. You should keep in mind, though, that many slightly older products are still worth

checking out and are still available. For additional gift ideas, be sure to see our feature story "Top 100 CD-ROMs" (September 9, 1997) and the winter 1998 issue of *Your New PC*, from the editors of *PC Magazine*, currently available at local newsstands (www.pcmag.com/newpc).

The titles in this story are split into three main categories: Games, Kids' Software, and Home and Reference Software. The Games category is further split into six subcategories, while Kids' Software is divided into two groups, based on approximate age ranges (although most of the kids' titles can appeal to a variety of ages). Unless otherwise noted, all of the software titles in this story run under Microsoft Windows 95.

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After Hours



GAMES

ACTION

Half-Life (\$50 street; Sierra On-Line, 800-757-7707, www.sierra.com). Half-Life is a sophisticated

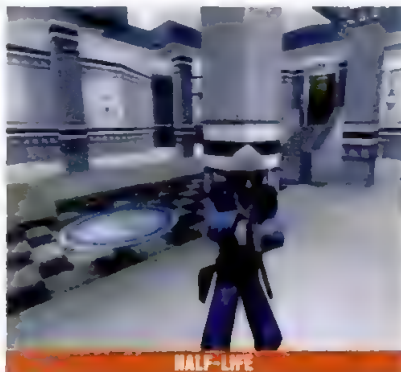
first-person action game with a plot right out of "The X-Files." The game drops you smack in the middle of a battle between aliens and government troops—both of whom see you as a threat. As you fight your way through the game, you'll face intelligent enemies who coordinate their attacks and use cover to their advantage (what a novel idea). The

level designs are good and blend together in a near-seamless fashion. Based on a highly modified Quake engine, Half-Life boasts a number of impressive features, including 16-bit color, colored light, very detailed enemies and creatures, and 3Dfx support.

Hexen II (\$50 street; Activision, 310-255-2000, www.activision.com). An-

other beautifully rendered game from Raven Software (now owned by Activision), Hexen II is a first-person action game based on the Quake engine. You have to conquer four different lands as you try to rid your world of Eidolon, last and most powerful of the Serpent Riders. This game offers role-playing elements, challenging puzzles, fantastic graphics, and great level designs. You can also play the game as one of four different characters (Assassin, Crusader, Necromancer, or Paladin). This is another game that looks even better with a 3Dfx graphics accelerator.

Jedi Knight: Dark Forces II (\$50 street; LucasArts Entertainment Co., 888-532-4263, www.lucasarts.com). Without question, this title is one of



HALF-LIFE

the best games of the year. Jedi Knight is a first-person action title set in the *Star Wars* universe. Playing as Kyle Katarn, you track down Jerec, a Dark Jedi who is bent on resurrecting the Empire. Along the way, you must master the Light or Dark side of the Force and fight your way past hordes of alien scum and Imperial troops. You'll also face a host of Jerec's Dark

Jedi in deadly light-saber duels. This game also includes Direct3D support and (unlike the original Dark Forces) extensive multiplayer support.

Quake II (\$50 street; Activision, 310-255-2000, www.activision.com). A title that's to light up sales charts for

months to come, id Software's Quake II (published by Activision) is one of the most anticipated releases of the year. In addition to the game's welcome return to a DOOM-like atmosphere, Quake II offers a vastly improved graphics engine (one that will certainly set the tone for the next wave of first-person games). It almost goes without saying that Quake II will support 3Dfx acceleration. Other new twists include more interesting level designs, far deadlier enemies than in the original Quake, and (need we even say it?) top-notch multiplayer support. Rest assured, Quake II will be the action fan's action game.

Tomb Raider 2 (\$45 street; Eidos, 415-547-1200, www.eidosinteractive.com). Lara Croft, the pistol-toting heroine who's graced the cover of more than 40 magazines (not all of them computer-related), returns in an all-new third-person adventure. Tomb Raider 2 offers an enhanced graphics engine with 3Dfx support, more realistic environments, and visibly improved lighting effects. Eidos has even gifted Lara with a few improvements, including a stylish ponytail, a less pointy physique, and a jacket (her legs must still get cold, though).

Unreal (\$55 street; GT Interactive, 800-610-4847, www.gtinteractive.com). Built around a powerful graphics engine, Unreal offers an array of eye-popping scenery, effects, and (of course) monsters. The game also offers unparalleled lighting effects and supports some revolutionary multiplayer options, such as the ability to link multiple servers into a single, near-seamless

death-match arena. If this staggeringly impressive first-person action game ships on time, you can expect it to challenge Quake II for the action genre's crown. Like most of the game's first-person competitors, Unreal will support 3Dfx acceleration.



VIRTUA FIGHTER 2

Virtua Fighter 2 (\$40 street; Sega Entertainment, 888-734-2725, www.sega.com). On video gaming consoles (such as the Sony PlayStation), martial arts fighting games abound. On PCs, options are fewer, and quality titles are fewer still. Luckily, we have Virtua Fighter 2. This fast-moving, hard-hitting fighting game offers good graphics and animation, solid multiplayer options, 1,200 fighting moves, and an expert mode in which the computer learns to combat your individual style.

ADVENTURE/ROLE PLAYING

Blade Runner (\$60 street; Westwood Studios, 800-874-4607, www.westwood.com). Our pick to top the holiday sales charts, Blade Runner is a revolutionary, action-oriented adventure game. Set in the world of Ridley Scott's 1982 film, Blade Runner challenges you to hunt down—or help—Replicants. The program's story actually runs concurrently with the action of the film, so while you're out chasing Replicants, you'll get periodic updates on Deckard's progress (Harrison Ford's character in the



QUAKE II



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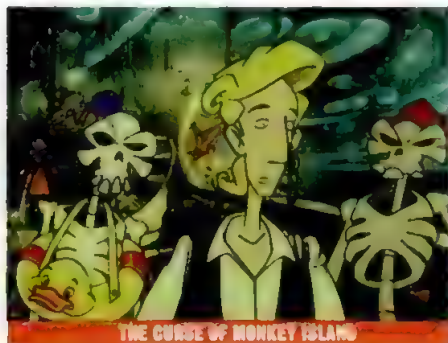
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movie). The game's 24-bit graphics are phenomenal, and the story is dynamic and intriguing. Stunning cinematic sequences blend smoothly with action, bringing the game as close to an interactive movie as possible. Blade Runner is unlike any other adventure game we've seen before and should be one of the year's best.

Broken Sword: The Smoking Mirror (\$60 street; Virgin Interactive Entertainment, 714-833-8710, www.vie.com). A great-looking third-person graphic adventure game, Broken Sword should appeal to any serious adventure-gaming fan. Gorgeous, hand-drawn animation and varied, cinematic camera angles help set the scene for a complex story involving a drug lord and an evil Mayan deity (nice combination, huh?). This sequel to last year's Circle of Blood includes the same two leading characters (George and Nico), hundreds of puzzles, and over 70 different characters to meet.

The Curse of Monkey Island (\$50 street; LucasArts Entertainment Co., 888-532-4263, www.lucasarts.com).



THE CURSE OF MONKEY ISLAND

This long-awaited sequel is even funnier and more enjoyable than the original Monkey Island games (both still available as part of the \$45 LucasArts Archives, Vol. III). Featuring a wonderful new look and movie-quality animation, The Curse of Monkey Island pits you, Guybrush Threepwood, in yet another struggle against the evil undead pirate LeChuck. He's still after your one true love, Elaine, and you must use a bevy of insults, wisecracks, and wit to save her. The Monkey Island faithful will be happy to hear that the original music has been



RIVEN: THE SEQUEL TO MYST

included and enhanced in this title.

Dark Earth (\$65 street; MicroProse Software, 800-695-4263, www.microprose.com). An intriguing, action-oriented adventure game with spectacular graphics, Dark Earth provides an excellent diversion from typical adventure fare. The game drops you into a postapocalyptic world in which the residents worship light and fear darkness. As Arkahn, Guardian of Fire, you must uncover a sinister plot while battling the effects of a deadly poison—all in real time. Dark Earth offers a good mix of puzzle solving and combat, combined with stunning background art.

Fallout (\$50 street; Interplay, 800-468-3775, www.interplay.com). This is the impressive though unofficial sequel to Wasteland, an all-time classic role-playing game from the days of the Commodore 64. Fallout uses a Diablo-style graphics engine

and an intricate role-playing system. Players must survive in yet another postapocalyptic world, where gangs, mutants, radiation, and violence are all too common. The game uses a flexible experience-level system, so players can shape their characters in any way they see fit. Also, combat is turn-based, so you don't have to click madly on the mouse to win. Fallout does a good job of

mixing a classic game design with contemporary bells and whistles.

Riven: The Sequel to Myst (\$60 street; Red Orb Entertainment, 415-382-4400, www.redorb.com). As if the game needs an introduction: Riven follows up one of the top-

selling games of all time. While Myst fans will probably buy this one without a second thought, the rest of us should be interested to know that the game includes an improved graphics engine, more use of animation and video, and even more complex and bizarre game play. Will Riven sell four million units, as Myst did? Probably not, but it should still please the Myst fans on your list.

Ultima Online (\$64.95 list, plus \$9.95 a month; Origin Systems, 800-245-4525, www.ultimaonline.com). A finalist in our Awards for Technical Excellence, Ultima Online is an Internet game of epic proportions. After you sign up, you create a custom character, then join thousands of other users for an open-ended adventure in the far-flung virtual world of Britannia. You can hunt, mine, trade, go on quests, and interact with comrades and enemies alike. You can even set up your own virtual business (some players have already launched a storage business in the game). You have to master a trade and earn a living in this game, but even that can be



ULTIMA ONLINE

fun. Ultima Online can be a bit sluggish over some 28.8-Kbps connections, but the game is an online experience not to be missed.

STRATEGY

Age of Empires (\$55 street; Microsoft Corp., 800-426-9400, www.microsoft.com). A very impressive game from the folks in Redmond, Age of Empires combines some of the intricacies of Sid Meier's Civilization with the fast, exciting pace of Command & Conquer. Leading 1 of 12 ancient civilizations, you must conquer your foes through diplomatic, economic, or military means, all



AGE OF EMPIRES

while driving forward in technology from the Stone Age through the Iron Age. The game features excellent multiplayer options and an impressive graphics engine. Watch out for the game's insanely difficult artificial intelligence, which can be a bit frustrating at times.

Dark Reign (\$49.95 list; Activision, 310-255-2000, www.activision.com). This much-heralded game is basically a Command & Conquer clone with lots of bells and whistles. Very cool graphics, a good story line, and a multitude of unit commands (including navigation by a series of coordinates, or waypoints) help set the game apart from its many competitors. If you have any real-time strategy fans on your gift list, this game will probably satisfy their appetites for destruction.

Imperialism (\$50 street; Strategic Simulations Inc., 408-737-6800, www.ssionline.com). A turn-based

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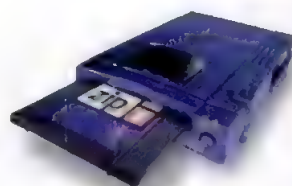
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game of world domination set in a fictional 19th-century world, Imperialism is a highly impressive title with addictive game play. The game is basically similar to Sid Meier's Civilization but with a tighter period focus and more diplomacy options. In fact, Imperialism's complex and versatile systems for diplomacy, economics, and combat let you take on the world in any way you see fit. Uniquely styled graphics and interface screens enhance the game and lend tremendous atmosphere.

NetStorm (\$49.95 list; Activision, 310-255-2000, www.activision.com). One of the most original games we've ever seen, this real-time strategy title is among the first to be designed specifically for Internet play. As high priest or priestess of an island fortress floating in the atmosphere, you must defeat other players by building bridges through the air and carefully placing a series of stationary units. The ultimate goal is to cap-



ture and sacrifice the enemy high priest to your Fury (neat!). The chesslike game play is greatly enhanced by superb graphics and a meditative, New Age sound track.

Panzer General II (\$50 street; Strategic Simulations Inc., 408-737-6800, www.ssionline.com). Sequel to one of the greatest war games of all time, Panzer General II features the same "easy to learn, difficult to master" game play found in all previous General titles. This time around, however, the graphics have been completely revamped to include 30 hand-painted battle maps and incredibly detailed

unit art (taken from photographs of tabletop gaming miniatures). The game play is greatly enhanced as well, with such new features as technology research, unit commanders, and an editor for unit and scenario data. Panzer General II includes five campaigns and lets you command American, British, German, and Russian forces.

Sid Meier's Gettysburg (\$55 street; Origin Systems, 800-245-4525, www.origin.ea.com). One of the most impressive games we've ever seen, Sid Meier's Gettysburg is a monumental war game based on the pivotal Civil War battle. Fantastic graphics and well-implemented real-time combat help enhance the realism of this complex title. You can command either side of the epic conflict in a single scenario or a full-battle campaign (which typically takes seven scenarios to run its course). Because the

game includes both historical and hypothetical engagements, each campaign you fight can be different. Commanders ride back and forth to urge troops forward, trumpets blare, and rebel yells come ringing through the smoke. There has

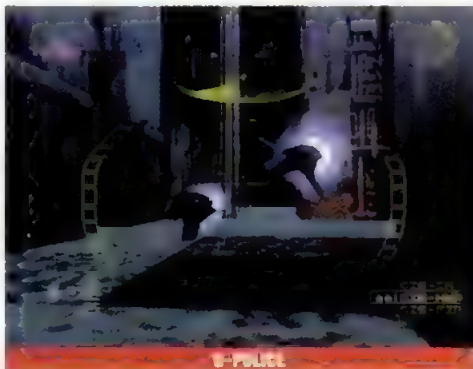
never yet been another game like Gettysburg, and serious fans of strategy and war games will love it.

Total Annihilation (\$49.95 list; GT Interactive, 800-469-5961, www.gtinteractive.com). This game helps breathe new life into an increasingly tired genre. Boasting modest system requirements, an excellent variety of units to command, and the best graphics in the action-oriented, real-time strategy crowd of games, Total Annihilation has all the makings of a hit. The game also offers a wide variety of unit commands and the availability of new unit types on

the developer's Web site (www.cavedog.com). When all is said and done, this program looks like the new king of the mainstream real-time-strategy crowd.

SIMULATIONS & SCI-FI

G-Police (\$50 street; Psygnosis, 800-438-7794, www.gpolice.com). This sci-fi action game plays a little like MechWarrior 2 in a hover car and looks about as good as any 3-D-



accelerated game you'll ever see. Your job is to patrol the city in a funky helicopter-like craft guided by a radio dispatcher, who directs you to inspect suspicious vehicles, take out bad guys, and lend support to other police units on the ground. Along the way, you're treated to a visual feast: The game's graphics and lighting effects are among the best around (especially in 3Dfx mode).

Longbow 2 (\$60 street; Origin Systems, 800-245-4525, www.origin.ea.com). The original Longbow was one of the best-looking and most realistic flight simulations ever released. The sequel is vastly better in both respects. Sporting an amazing, 3Dfx-enhanced graphics engine, Longbow 2 is a joy to behold. The game is also a



lot of fun to play. It features a dynamic campaign generator, a variety of difficulty settings, and complex mission structures. If you've ever even thought about playing a helicopter simulation, this is the title to get.

Red Baron II (\$55 street; Sierra On-Line, 800-757-7707, www.sierra.com). Red Baron II is possibly the most detailed and realistic World War I flight simulation yet released. The game lets you play through a career, fly single missions, or engage in multiplayer dogfights. The graphics are excellent, and the artificial intelligence provides for some tough dogfight opponents. You can fly more than 22 different planes and even customize the insignia and paint scheme on your own aircraft.

Wing Commander Prophecy (\$55 street; Origin Systems, 800-245-4525, www.origin.ea.com). After a brief hiatus and the departure of the series' originator, Wing Commander is back. The latest installment of the classic sci-fi series pits you against a new,



unknown race of alien bad guys in weird-looking ships. Players once again enact the part of a hotshot rookie pilot trying to make a name for himself. The movie-style cinematic sequences are still a part of the game, but this time the action plays a more important role. With a completely revamped graphics engine (with 3Dfx support), a greater variety and number of mission types, and new multiplayer support, Wing Commander Prophecy looks like a sure bet to be a best-seller this holiday season.



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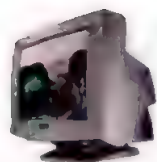
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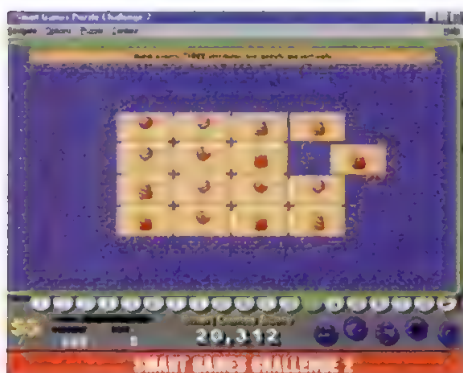
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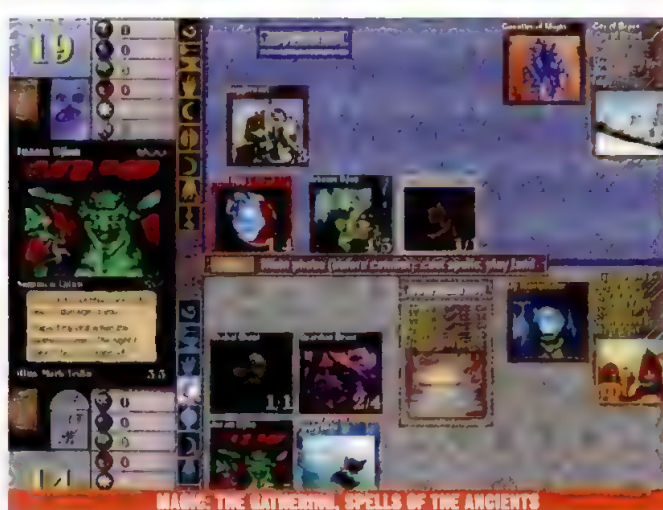
X-Wing vs. TIE Fighter (\$49.95 list; LucasArts Entertainment Co., 888-532-4263, www.lucasarts.com). When this game first came out, it impressed us despite a few glaring faults. Now, after the addition of a few patches and enhancements (including a 3Dfx upgrade), X-Wing vs. TIE Fighter is better than ever. This definitive game of multiplayer space dogfights is sure to please any *Star Wars* fan. Single-player types will want to keep their eyes out for the new expansion pack, however: X-Wing vs. TIE Fighter: Balance of Power will add single-player campaigns, fully rendered cut-scenes, and new ships to fly (including the long-overdue B-Wing).

FAMILY/CLASSICS

Magic: The Gathering, Spells of the Ancients (\$30 street; MicroProse Software, 800-695-4263, www.microprose.com). An expansion set for Magic: The Gathering, Spells of the Ancients introduces a much-improved interface, 143 new cards (including the Unlimited, Arabian Nights, and Antiquities card sets), a new deck generator, and over 60 new prebuilt decks. The title also includes a coupon for free time on the forthcoming multiplayer version of Magic. For Magic fans, this expansion set will provide countless hours of game play and an array of new challenges.



The Simpsons: Virtual Springfield (\$30 street; Fox Interactive, 310-369-7000, www.foxinteractive.com). Have you ever wanted to take a tour of the world's most dysfunctional town? Now you can. This CD-ROM—a must-have for any "Simpsons" fan—lets you wander the streets of Springfield. You



can't quite roam freely in the town, but you can explore the Simpsons' home, tour the power plant, and visit Moe's Tavern, among other locations. Along the way, characters from the TV show will pop up and wander by, spewing witticisms as they go. As you explore, be sure to hunt down the virtual trading cards hidden throughout the town.

Smart Games Challenge 2 (\$29.95 list; Smart Games Inc., 508-745-9900, www.smartgames.com). The follow-up to last year's highly successful puzzle game, Smart Games Challenge 2 is the perfect gift for anyone who likes brainteasers and logic puzzles. A collection of all-new games (including a trivia game) will challenge even the most quick-witted of players. The games may seem simple at first, but as you progress through the dozens of difficulty levels for each, you're sure to get stumped more frequently along the way. If you travel a lot for business, this is a great game to keep loaded on the laptop.

You Don't Know Jack III (\$30 street; Berkeley Systems, 510-540-5535, www.berksys.com). Jack's back for a third go-round. This iteration of the trivia game with an attitude features over 800 new questions and a few new categories, such as "Impossible Questions" and "Threesome Ques-

tions." The game supports up to three players on a single keyboard and can lead to some hilariously frantic multiplayer bouts. As always, some of the humor is geared toward adults, so you might want to reserve this program for the older members of the family.

SPORTS

Links LS 1998 Edition (\$45 street; Access Software, 800-800-4880, www.accesssoftware.com). When it comes to PC golf simulations, there's Links and then there's everything else. This golf game offers a great balance of game play, graphics, and realism, and it's sure to please even the most hard-core fairway fans. It's challenging and realistic enough to satisfy serious golf fans but easy enough to learn that novice users should also enjoy it. The game also supports a vast array of add-on course disks, to

keep the challenge fresh. If you're a golf fan who travels a lot, make sure you load this game up on your laptop.

NBA Live 98 (\$50 street; Electronic Arts, 800-245-4525, www.easports.com). Very similar to its hockey cousin in look and feel, NBA Live 98 is another fine sports game from Electronic Arts. Featuring highly detailed graphics, player animations, and stadium art, this title looks more like a television broadcast than a computer game. The 3Dfx-enhanced mode only adds to this effect. Game play is great, too, with revamped artificial intelligence and strong league-play support. You'll find it a bit easier to dunk this time around—if you can snake by the computer's tough defense, that is. This is a must-have for PC-packing hoops fans.

NHL 98 (\$50 street; Electronic Arts, 800-245-4525, www.easports.com). Able to fend off growing competition in the computer hockey arena, NHL 98 retains its crown as best PC hockey game—and possibly the best PC sports game overall. This year, the game features even better 3-D polygonal graphics, 3Dfx support, and more realistic game play, including customizable coaching strategies. League play is as solid as ever, and the game's difficulty levels have been tweaked to offer more challenging computer opponents. This title has been very good in the past; this year, it's great.—MER



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 **TEXAS
INSTRUMENTS**



AGES 3 TO 8

Backyard Baseball (\$39.95 list; Humongous Entertainment, 800-499-8386, www.humongous.com). Any Little League fan is sure to enjoy Backyard Baseball, one of the first children's sports games that combines the performance of a grown-ups' game with the splash, colors, and difficulty levels of a kids' title. Kids can set up their teams, picking players, team names, and uniforms. Once they're out on one of the ten realistic and charming fields, kids can choose their plays, pitches, and swings. The



game is basic enough for a 5-year-old yet difficult enough to keep older children (and adults) entertained.

Big Thinkers Kindergarten (\$39.95 list; Humongous Entertainment, 800-499-8386, www.humongous.com). There are many preschool titles available today, but few are as entertaining as Big Thinkers Kindergarten. The title includes 16 activities and teaches 14 different kinds of skills, including the alphabet, music and art creativity, basic math and measurement, time telling, and spatial perception. Other lessons include one that helps kids learn environmental science and why it's important to recycle. We especially liked the program's Silly Stories and

reward-based curriculum, which will help boost kids' self-esteem.

The Cat in the Hat (\$30 street; Broderbund Software, 800-521-6263; www.broderbund.com). The latest title in Broderbund Software's Living Books line, The Cat in the Hat will provide hours of fun. Dr. Seuss's classic story of the mischievous 6-foot cat in the striped hat plays even better on CD-ROM than it does on paper, since the disk also has voices, actions, and character asides. The program's animation is superb, and the voice-overs fit perfectly with the drawings. As with other Living Books, kids can sit back and listen to the story or choose the Let Me Play option where they jump from page to page and go directly to the program's various activities.

Crayola Print Factory (\$30 street; IBM Consumer Division, 800-426-7235, www.pc.ibm.com/multimedia). What kid doesn't love creating artwork to hang on the refrigerator? With Crayola Print Factory, children can make their own art and much more. Kids can use the title to create greeting cards, stickers, paper toys, invitations, posters, and banners, along with more than 20 other kinds of projects. Kids and parents both will delight in using their PCs to make masks, airplanes, and puppets. The program comes with ten pieces of art paper, but make sure you buy another box if you're giving this as a gift: Kids go through it quickly.

Fisher-Price Ready for School Toddler (\$45 street; Davidson & Associates, 800-545-7677, www.education.com). With Fisher-Price Ready for School Toddler, Davidson has come out with the ultimate educational primer for very young children. The two-CD-ROM set is very basic, but that's exactly why it should appeal to toddlers. The program is designed to teach children about animal sounds, body parts, manners, cause and effect, shapes and colors, and the alphabet without

After Hours



confusing them. Parents may find the pace a little slow, but the toddlers we tested the program with instantly fell in love with the Little People characters and soothing voices.

Fisher-Price Wild Western Town (\$20 street; Davidson & Associates, 800-545-7677, www.education.com). Fisher-Price Wild Western Town lets children play cowboy and cowgirl right on the PC screen and search for gold that's been stolen and scattered all over town by the dastardly Saddle Sam. Kids move from one activity to another, solving puzzles and finding the loot. In addition to puzzles, the game also has fun activities and exciting stories. There are even some cool, Western-theme songs that kids can sing along to.

Mercer Mayer's The Smelly Mystery (\$24.95 list; GT Interactive, 800-610-4847, www.gtinteractive.com). What would you do if you woke up one morning and found out that all of the smells in your world had been mixed up? Children playing the interactive mystery story on this CD-ROM

will get the chance to find out. The game asks kids to find clues to the switched-smells puzzles and unearth the guilty parties. Each time kids play the game, they can get a different ending and a different culprit. Along with puzzles, there are also plenty of hot spots and hidden surprises to keep kids guessing.

Putt-Putt Travels Through Time (\$39.95 list; Humongous Entertainment, 800-499-8386, www.humongous.com). Another great kids' game from Humongous, this adventure sends kids on a quest through time with Putt-Putt, the little purple car. Seems that he's lost his homework, his school supplies, and even his dog pal Pep in a freak time-



machine accident. By guiding Putt-Putt through the age of dinosaurs, a Wild West town, a Medieval castle, and the future, kids can help him to retrieve the lost items. Excellent animation, dialogue, and music highlight this wonderful game.



Ready for Math with Pooh (\$40 street; Disney Interactive, 800-900-9234, www.disneyinteractive.com). Ready for Math with Pooh helps your children learn math basics like counting, sorting, addition, subtraction, and patterns. The story begins in the beautifully animated 100 Acre Wood, where kids attempt to complete a variety of lessons at

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After Hours

three skill levels. Players are rewarded with a seed for each completed activity, and as they learn, a virtual garden will grow with their talents. By the time kids master the entire CD-ROM, a wonderful garden has appeared.



Schoolhouse Rock! 1st and 2nd Grade Essentials (\$34.95 list; Creative Wonders, 800-543-9778, www.creativewonders.com). Schoolhouse Rock! 1st and 2nd Grade Essentials features two CD-ROMs that teach reading, math, language arts, social studies, and science. The title mixes 20 engaging activities with 17 original "Schoolhouse Rock!" videos, complete with songs. A different, recognizable "Schoolhouse Rock!" character in a familiar environment leads each activity. The program stands out from the rest for its innovative games and teaching methods, which are so much fun that kids won't realize they're working on important skills. *

Spy Fox in Dry Cereal (\$39.95 list; Humongous Entertainment, 800-499-8386, www.humongous.com). Uh-oh! All of the cows on Earth have been stolen, making it impossible to eat cereal or drink chocolate milk. It's up to your children to help Spy Fox, the secret agent, find Mr. Udderly (president of Amalgamated Moo Juice Inc.), locate and decipher clues, and return the cows to their barns and meadows. Players get help from Spy Fox's partner Monkey Penny, Professor Quack, and a host of other quirky characters. Kids will love the neat spy gadgets and

fun puzzles, as well as the ability to interact with the characters: Children can "talk" to characters and ask them questions.

Stellaluna (\$30 street; Broderbund, 800-521-6263, www.broderbund.com). This CD-ROM version of Janell Cannon's award-winning children's book will delight both parent and child. The interactive story of a lost bat who drops in on a nest of birds is beautifully drawn and narrated. Kids can settle back and listen, or they can jump into the story and explore the on-screen en-

vironment. Children find wonderful, clickable surprises at every turn to keep their interest piqued, and a special Bat Fact section to teach them about the often-misunderstood species.

Young Dilbert: High-Tech Hi Jinks (\$34.95 list; KnowWonder, 425-482-0202, www.knowwonder.com). Following the premise that everyone was once young, KnowWonder shrinks Dilbert, the popular cartoon character, down to a pint-size version of himself. Young Dilbert: High-Tech Hi Jinks helps kids learn the basics about computers.



With all the irreverence of the original cartoon strip, Young Dilbert, along with his friends, asks kids to work through four modules that teach kids about PC components and about using the Web as a research tool. The program's included problems also help teach spatial relationships, matching, problem solving, and patterns. Technophobe parents will get a lot from the title too.—KJB

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AGES 8 AND UP

The American Girls Premiere Set (\$40 street; The Learning Company, 800-227-5609, www.learningco.com). The American Girls Premiere Set lets children create, write, and produce plays starring dolls from the popular toy line of the same name. Felicity, Kirsten, Addy, Samantha, and Molly are all here, each dressed in the clothes of her corresponding historical period. Kids can add their own voices and make the characters talk, select costars, and choose the wardrobe for each play. Then kids play back their creations and save them to share with friends. This title also includes a 128-page Club handbook, a baseball cap, and a membership card.

Barbie Print 'N' Play (\$30 street; Mattel Media, 310-252-2000, www.mattelmedia.com). Barbie Print 'N' Play lets kids create fun projects using the Barbie motif. Children make



GOOSEBUMPS: ATTACK OF THE MUTANT

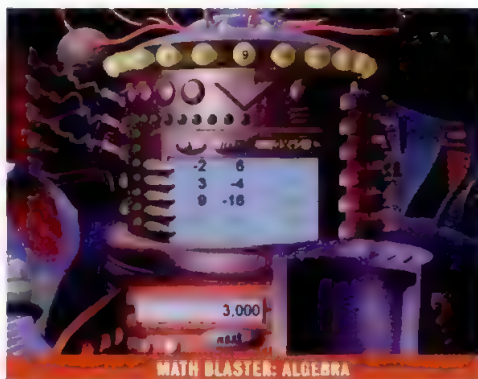
letterheads, invitations, party favors, and neat accessories for themselves as well as for Barbie. We loved printing up Barbie-size picnic paraphernalia, tiny Barbie party hats, and cute fortune-telling finger toys. Each project is simple to complete and can be personalized. Although this program was designed for children, adult Barbie collectors will also appreciate receiving it as a gift.

Goosebumps: Attack of the Mutant (\$45 street; DreamWorks Interactive, 800-426-9400, www.dreamworksgames.com). The latest title in the Goosebumps series is gory, scary, and fun to play. This first-person action game features the Masked Mutant and his terrifying plan to take over the world. Of course, thwarting him is the focus of the game.

There are 15 levels and a number of superheroes that players can team up with to crush the Mutant and foil his plans. Celebrity voice-overs from Jim Belushi and Adam West make the game even more fun.

Hercules Action Game (\$40 street; Disney Interactive, 800-900-9234, www.disney.com). Disney's Hercules Action Game—which is based on last summer's blockbuster film—gets kids right into the thick of things. Children take on Hercules's persona and battle their way through three ancient worlds and ten fast-paced stages. The quest includes battling Titans on Mount Olympus and overcoming Hades to recapture immortality. Each puzzle and adventure shows off the title's fine animation and fun celebrity voice-overs, which include Danny DeVito as Phil, James Woods as Hades, and Bobcat Goldthwait as Pain.

JumpStart Typing (\$30 street; Knowledge Adventure, 800-542-4240, www.adventure.com). The newest addition to the JumpStart series, JumpStart Typing is a perfect primer, whether you're 5 or 50 years old. Instead of boring drills and ho-hum lessons, you'll be taken on an Olympic-style keyboarding competition that features extreme sports such as snowboarding, skateboarding, and



MATH BLASTER: ALGEBRA

wall climbing. You'll learn the basics via fun newsreel spoofs and an innovative Natural Language Generator, which creates words containing keys you're having trouble mastering. The program tailors more than 30 typing lessons to your abilities.

Math Blaster: Algebra (\$30 street; Davidson and Associates, 800-545-7677, www.education.com).

Your spaceship is cruising through the galaxy when it's hit by an asteroid. Evil aliens are set on destroying the ship. You can stop them only by fixing the ship before the aliens can get to it. Math Blaster: Algebra asks children to do just that, by solving algebraic expressions, graphing lines and parabolas,

factoring, and solving quadratic equations. Each of the ship's six damaged rooms features a different subject; in addition, there's a Strategy Room where kids can pick up tips on how to solve the problems and work through equations.

My Personal Tutor (\$30 street; Microsoft Corp., 800-426-9400, www.microsoft.com). Children learn skills at their own pace, and Microsoft designed My Personal Tutor based on this premise. The program lets parents tailor learning based on skills alone, rather than age. The four CD-ROMs—Preschool Skills, Reading,



ONLY'S DRAW-A-STORY

Math, and Alphabet—feature a kindly tutor, Professor Presto, who helps kids get over the rough spots as they learn. The program excels because of the sheer depth and num-

Gift Gadgetry

Don't worry; we haven't completely forgotten about hardware for this holiday gift guide. The five products listed here are some of our favorites, and they cover a broad range of tastes, age groups, and functions.

Regardless of your gift-buying needs, we're sure that at least one of these hard-core hardware products will make a great gift for the PC user on your list. Some friendly advice: If you buy Barney, pick up some spare batteries, and if you buy the DeskJet, throw in some extra paper.



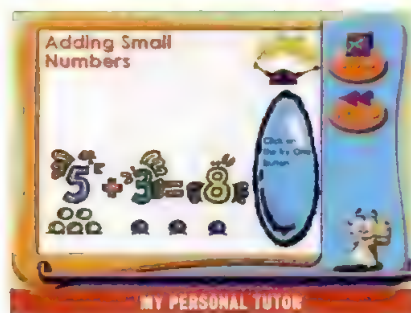
Actimates Barney (\$109.95 list; Microsoft Corp., 800-426-9400, www.microsoft.com) This talking, moving Barney doll interacts with PC software and videos on TV. Pretty cool stuff—don't let the fuzzy purple exterior fool you.

Microsoft SideWinder Force Feedback Pro

(\$150 street; Microsoft Corp., 800-426-9400, www.microsoft.com). CH Products' force-feedback joystick was first, but Microsoft's is better. This is (currently) the joystick to have.



ber of activities that it includes. We also liked the reward-based focus of My Personal Tutor: As children com-



plete the program's tasks, they are working toward a larger goal.

Orly's Draw-A-Story (\$30 street; Broderbund Software, 415-382-4400, www.broderbund.com). Tired of the same old CD-ROMs? Broderbund's Orly's Draw-A-Story combines four whimsical stories and a first-rate set of drawing tools with your child's imagination to create a wonderful and unique software experience. Part storybook and part activity center, the program has kids spend the day with Orly in her native Jamaica, follow her adventures, and manually illustrate key elements of her stories. Kids draw flying machines, monsters, and surprises, and watch as their creations magically appear within the story.

The Princeton Review Inside the SAT and ACT Deluxe '98 Edition (\$50 street; Mindscape, 800-234-

3088, www.mindscape.com). Taking the SAT and ACT can be difficult. Mindscape makes studying for these tests a little easier with this comprehensive CD-ROM. There are plenty of print-outs, including new test questions, a Hit Parade of the 300 most commonly tested SAT words, and Flash Reports that keep you up to date on the latest test questions and answers. This title even helps students choose

a college: You'll find 1,500 college profiles, and Web links to school sites, scholarship information, and applications.

Secret Paths in the Forest (\$30 street; Purple Moon Software, 888-278-7753, www.purple-moon.com). 1997 has been a good year for girls' software, and Secret Paths is one of the better programs to break out of the pack. This beautifully drawn and illustrated CD-ROM places players in a secret tree house that leads to hidden stories and puzzles. Each time girls solve a puzzle, they receive a secret stone. The program comes with a pack of adventure trading cards and three secret stones that girls can use to make their own necklaces.

Smarty (\$35 street; Nicholson NY,

888-772-6877, www.spants.com). This offbeat CD-ROM teaches spelling, math, science, and music using superb animation, engaging stories, and a generous helping of humor. Mimi Smartypants, the heroine, is as unassuming and real as CD-ROM characters get. This literary adventure lets kids listen to stories and embark on their own adventures within Mimi's town; they can walk around and explore everything on-screen. Kids will find buried treasure to unearth, people to meet, and an Art Studio where they can create original jewelry and paintings.



Super Jewelry Kit (\$24.95 list; Print Paks, 800-774-6860, www.printpaks.com). Bringing back the magic of Shrinky Dinks (those cool plastic toys that you baked in the oven), Print Paks'



Super Jewelry Kit lets children design their own earrings, necklaces, pins, and rings, then print them out on special paper that shrinks down to kid-wearable sizes. Kids can create and customize many different pieces with the program's clip art, fonts, and patterns. When the young designers are finished, they print out their creations on a color ink jet and shrink them right in the oven.

Where in Time is Carmen Sandiego? (\$35 street; Broderbund Software, 415-382-4400, www.broderbund.com). Learning about history from a dusty old book can be a drag. Carmen Sandiego, the popular character from books, television, and computer games, makes learning little easier. This title takes kids through time, where they can bump into Christopher Columbus, meet Ben Franklin, and explore ancient and modern-day civilizations, all while searching for Carmen. The two-CD-ROM program features 18 adventures that span more than 3,000 years.

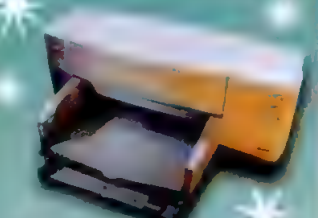
Word Heads (\$29.95 list; Theatrix, 800-955-8749, www.theatrix.com). Theatrix's Word Heads is a wonderful program that teaches kids language skills without talking down to them. The program spoofs cheesy game shows along with fluffy news programs, and the mix is infectious. After building their own characters, kids can flip from channel to channel, playing games and learning. Children can play the game head to head with friends both literally and figuratively, since they can scan in pictures of themselves and others.—KJB



3Dfx 3-D accelerator

(prices and manufacturers vary; www.3dfx.com). If you don't have a 3-D accelerator yet, you should get one. And 3Dfx is the name to look for. Many of this year's hottest games are optimized for the 3Dfx chip set, and for good reason: This product is incredibly fast and powerful.

Logitech TrackMan Marble (\$100 street; Logitech, 800-231-7717, www.logitech.com). The TrackMan Marble is our favorite trackball. It fits well into adult hands, and the included software lets you customize the TrackMan's three buttons—as by assigning a double click to one button.



HP DeskJet 722C

(\$350 street; Hewlett-Packard Co., 800-752-0900, www.hp.com). The most expensive gift suggestion in this year's Holiday Gift Guide, the HP DeskJet 722C is a home-oriented printer that's great for photos, family activities, and the occasional work-related project.

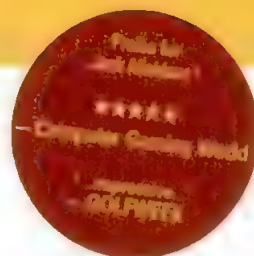
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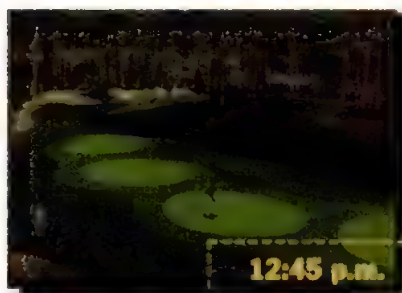
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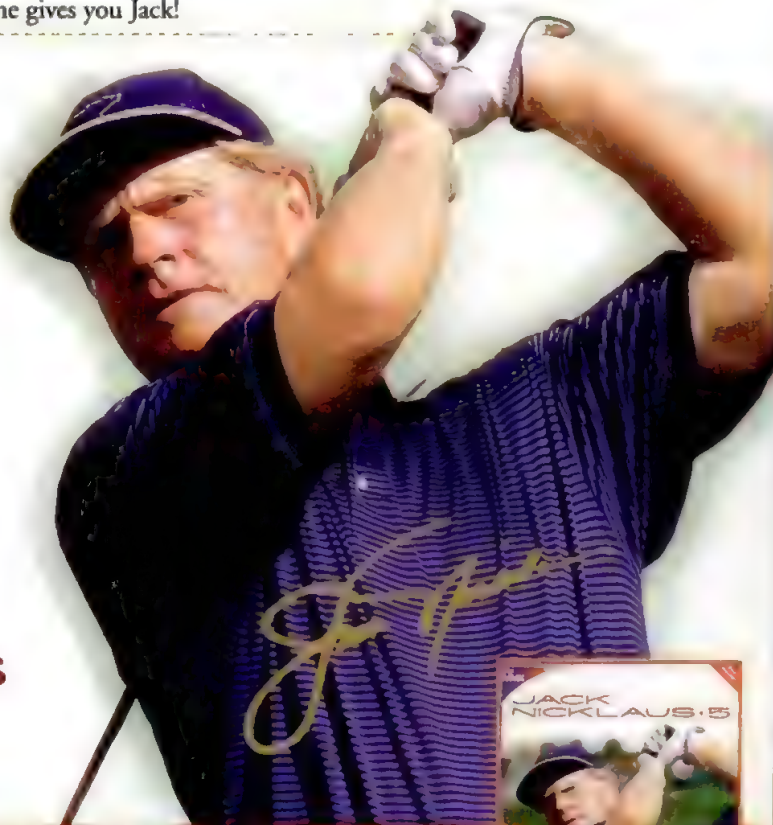


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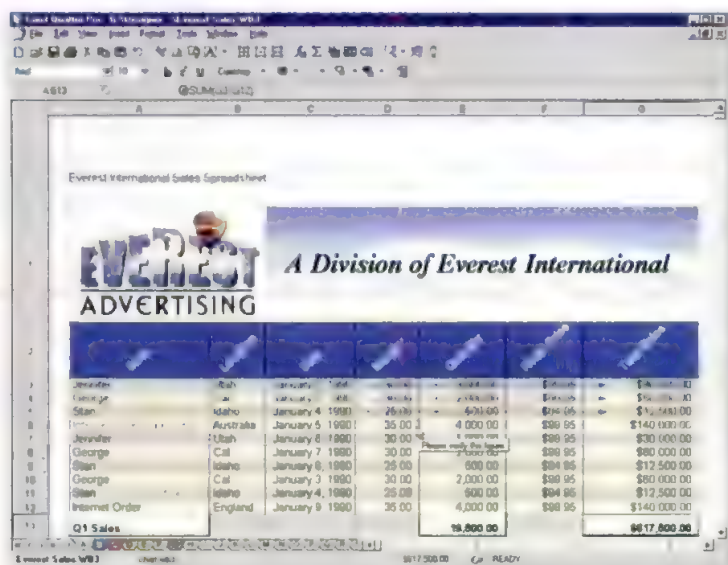


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After Hours



HOME & REFERENCE

The Complete National Geographic (\$200 street; Mindscape, 800-234-3088, www.mindscape.com). One of the most expensive products in this roundup is also one of the best. *National Geographic* has taken every single page it has ever published (including the ads), from 1888 through 1996, and organized the pages on a set of 30 CD-ROMs. If you're a subscriber to the magazine, you're probably salivating by now, and with good reason. This 108-year collection of articles, photographs, and ads is a wonderful program and the ultimate gift for any *National Geographic* fan.

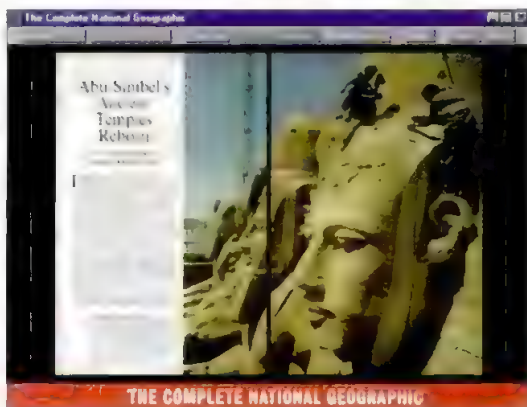
Easy Language: 17 Language Edition (\$30 street; IMSI, 800-833-8082, www.imsoft.com). A bargain in a software box, *Easy Language* is a great tool to have if you're planning any trips abroad. This single product can help you learn the basics of 17 different languages. Using video, role-playing scenarios, and a simple but effective voice recognition engine, *Easy Language* pulls out all the stops to teach you key words and phrases.

Home Medical Advisor (\$45 street; The Learning Company, Medical Library Division, 800-227-5609, www.learningco.com). A compre-

hensive yet easy-to-understand medical reference compendium, this CD-ROM serves as a diagnostic guide to symptoms, diseases, and medications. You can use it to match symptoms to possible ailments, learn more about prescriptions and over-the-counter medications, and research first aid and other medical conditions and treatments.

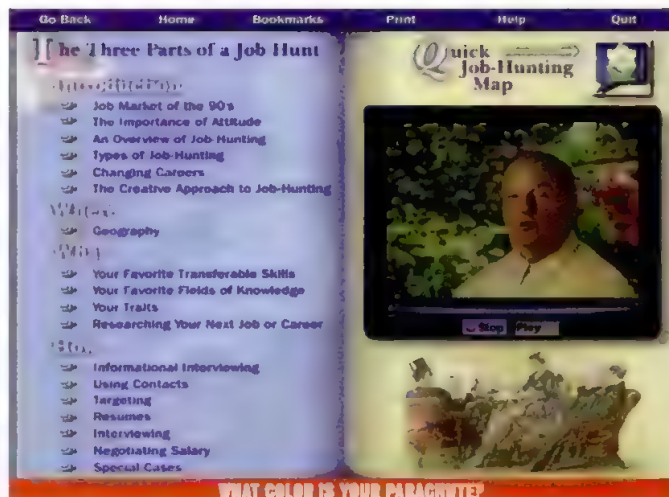
Microsoft Encarta 98 Encyclopedia Deluxe Edition (\$79.95 list; Microsoft Corp., 800-426-9400, www.microsoft.com). Another impressive showing in the Encarta series, this year's version includes 32,000 articles, 14,000 photographs and illustrations, and 1,000 maps. The title's content is still geared toward younger users (high-school ages, for the most part) but should be deep enough for most older users' needs. Some new features include a much-improved search engine, virtual tours of famous sites, and a very cool tool for organizing research papers.

PrintMaster Gold Deluxe Version 4.0 (\$50 street; Mindscape, 800-234-3088, www.mindscape.com). *PrintMaster Gold Deluxe* offers original content, thousands of graphics and projects, and a superior interface—a



great combination for home desktop publishing. The program lets you create newsletters, greeting cards, calendars, and a variety of other projects. Finally, *PrintMaster* boasts some impressive numbers: It includes more than 30,000 graphics, 5,400 photographs, and 4,000 design templates.

Rand McNally New Millennium World Atlas Deluxe (\$45 street; Rand McNally New Media, 800-671-5006, www.randmcnally.com). Another impressive product from Rand McNally, this title includes some wonderfully rendered maps and over 1.6 million place names. Users can



also pore over a wealth of information and statistics, read through hundreds of articles on geographic subjects, and view detailed street maps of 65 major cities. Thousands of online links help to keep the content current. If you're looking for a good multimedia world atlas, this product should fill the bill.

Rand McNally TripMaker Deluxe 1998 Edition (\$45 street; Rand McNally New Media, 800-671-5006, www.randmcnally.com). *TripMaker Deluxe 1998* edition stands out as this year's best all-round trip-planning software. The program's trip-planning wizard, map details, in-depth travel and attractions information, features for traveling with children, superior and flexible GPS interface, and developed Web content are all impressive. *TripMaker Deluxe* calculated our test trips faster than any of its competitors.

Stephen J. Hawking's Life in the Universe (\$39.95 list; MetaTools, 800-472-9025, www.metatools.com). Stephen J. Hawking serves as your

guide on a tour of the cosmos in this compelling title. You can learn about the latest theories of the evolution of life in the universe (complete with extensive diagrams and background notes) or tour the mysteries of space, guided by the vaguely *Myst*-style robot Phage. The title includes sever-

al online links to related Web sites, including Hawking's own "Life in the Universe" site.

3D Home Architect Deluxe (\$50 street; Broderbund Software, 800-521-6263, www.broderbund.com). Our Editors' Choice in the 3-D home design category for two years running, *3D Home Architect* is a complex yet streamlined package that should appeal to home designers of all skill levels. An intuitive interface leads users into many powerful design options. The title offers plenty of sample floor plans and helpful tips for improving your designs. The 3-D views are unspectacular, but they are rendered quickly by the program, and you can open multiple views at the same time.

What Color is Your Parachute? (\$49.95 list; BumbleBee Technologies, 617-263-1100). One of the most popular job-hunting books is now a CD-ROM. Based on the 1997 edition of the best-selling book, this title uses interactive exercises to help users figure out what steps they can take to find a new job. Author Richard Nelson Bolles offers video advice throughout. —MER

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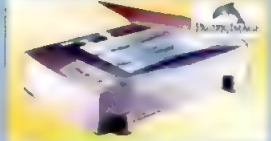
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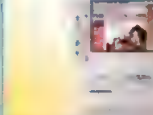
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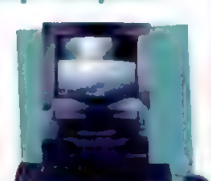


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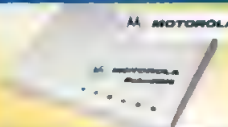
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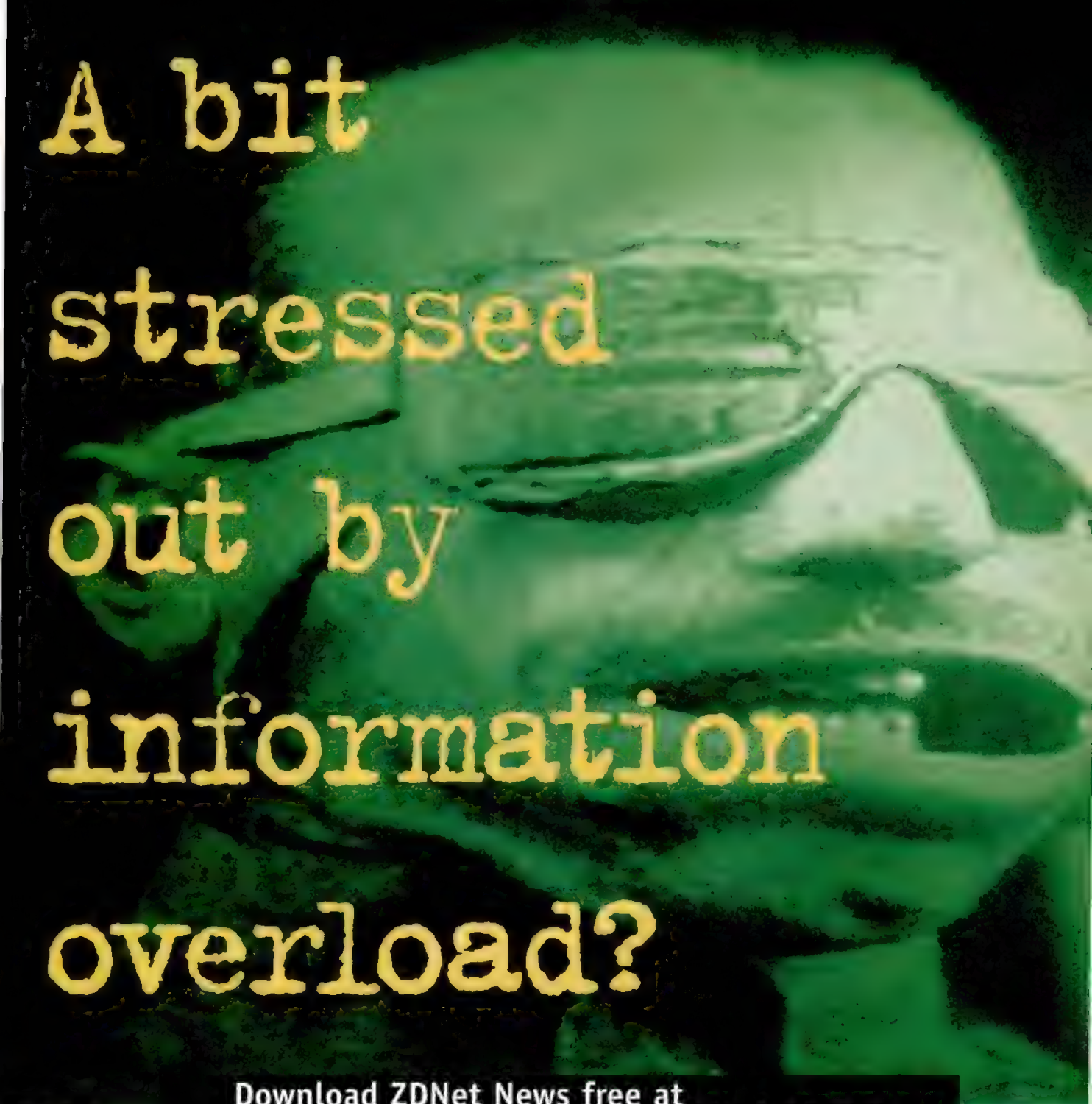
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All the Best

On the heels of our Awards for Technical Excellence, the *PC Magazine* editorial and labs staffs choose their favorite products of 1997—not necessarily the award winners. Find out what products we just plain liked—and didn't want to part with.

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- 4.3 GB Ultra DMA/33 Hard Disk
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- BOCA 56K Voice/Faxmodem
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A13-S2 1 **\$1,259.99**

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- AMD-K6 233MHz MMX CPU
- 32MB High-speed SDRAM
- 4.3 GB Ultra DMA/33 Hard Disk
- ATI Xpression 3D 4MB Video
- 24X CD-ROM Drive
- BOCA 56K Voice/Faxmodem
- 16-bit 3D Wave Table Sound

A13-S2 2 **\$1,239.99**

Pentium 233 MMX System

- Intel Pentium 233 MMX CPU
- 32MB High-speed SDRAM
- 4.3 GB Ultra DMA/33 Hard Disk
- ATI Xpression 3D 4MB Video
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- BOCA 56K Voice/Faxmodem
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- 24X CD-ROM Drive
- BOCA 56K Voice/Faxmodem
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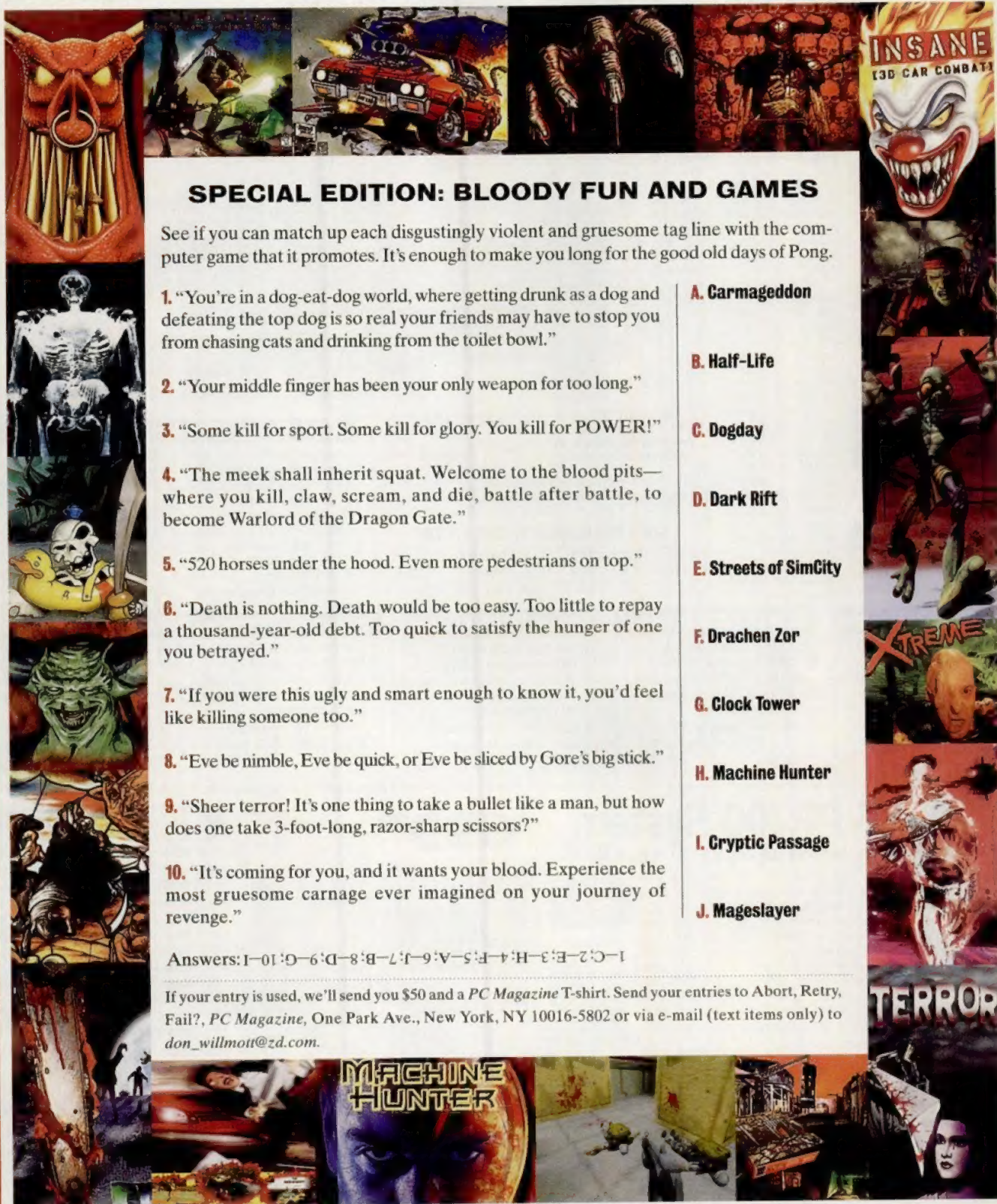
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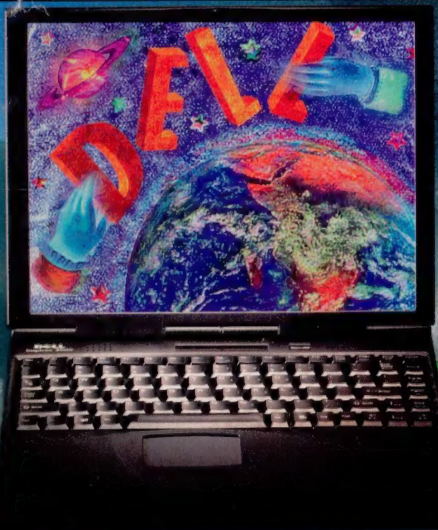
1. "You're in a dog-eat-dog world, where getting drunk as a dog and defeating the top dog is so real your friends may have to stop you from chasing cats and drinking from the toilet bowl."
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- A. Carmageddon**
- B. Half-Life**
- C. Dogday**
- D. Dark Rift**
- E. Streets of SimCity**
- F. Drachen Zor**
- G. Clock Tower**
- H. Machine Hunter**
- I. Cryptic Passage**
- J. Mageslayer**

Answers: 1-C; 2-E; 3-H; 4-F; 5-A; 6-J; 7-B; 8-D; 9-G; 10-I

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